

INFECTION CONTROL IN BRITISH HOSPITALS

A study of the planning, administration and effectiveness of infection control in British Hospitals with particular reference to the role of the Control of Infection Officer

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In 1967 the King Edward VII's Hospital Fund for London invited me to undertake an investigation into the Administrative Aspects of the Control of Infection in British Hospitals.

The terms of reference were:-

"To study the planning, administration and effectiveness of infection control in British Hospitals, with particular reference to the Control of Infection Officer."

This thesis embodies my findings and is submitted with the consent of the King's Fund.

I paid thirty-three visits to teaching, regional and mental hospitals, departments, regional hospital boards, hospital centres and medical schools. These were situated in England, Scotland and Northern Ireland.

The administrative structure for the control of infection differs for each hospital. The structures are of two main types corresponding to the two main types of medical administration. Irrespective of the type, one individual in each hospital - usually the bacteriologist - has all the problems on infection referred to him. He may be formally appointed Control of Infection Officer.

Various individuals - medical and science graduates, sisters and nursing officers - have been appointed to apply the results of the bacteriological examinations to the control of infection.

Opinions differ sharply as to the need for them and to their relative merits.

Some hospitals have, in addition, a Control of Infection Committee. These Committees differ widely in their constitution, activities and usefulness.

Many factors militate against the control of infection. These include the enforced use of obsolete buildings and equipment and inadequacies in the training of some undergraduates in bacteriology especially in its relation to clinical work.

Defects were found in the administrative structures for the control of infection. The placing of responsibility for executive action on the Control of Infection Officer without giving him adequate authority makes his position anomalous. Much time and energy of both skilled and semi-skilled workers can be wasted in the compilation and surveying of records of infection, especially if they are unnecessarily detailed and widely dispersed throughout the hospital.

There is need for a better appreciation among the medical staff of the importance of the control of infection.

The most important single factor for the control of infection is the state of the personal relations among the hospital staff. There should be better liaison between them and the local Medical Officer of Health.

A detailed summary and detailed recommendations are included in the Thesis.

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- C. The C. O. I. Officer. Extract from the Ministry of Health's Report "Staphylococcal infections in hospitals" (1959)
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- E. St. Bartholomew's Hospital - Charge to the Sanitary Officer.
- F. Constitution of the C. O. I. Committee. Extract from the Ministry of Health's Report "Staphylococcal Infections in Hospitals (1959). H. M. S. O. (The Report of the Cohen Committee). Para. 167.
- G. The Activities of the C. O. I. Committee. Extract from the Ministry of Health's Report "Staphylococcal Infections in hospitals (1959). H. M. S. O. (The Report of the Cohen Committee). Para. 168.

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1. INTRODUCTION

"Cross infection is my biggest headache. "

These words attributed to the Senior Administrative Medical Officer of one of the Regional Hospital Boards shows an awareness of the importance of the subject and its disastrous potentialities. There is every prospect that these difficulties will increase rather than decrease. (para. 12.8).

1.1 Origin of the Project.

In 1967 King Edward VII's Hospital Fund for London decided to sponsor an investigation into Administrative Aspects of The Control of Infection in British Hospitals. The idea for the project arose from discussions with Dr. Brendon Moore, Director of the Public Health Laboratory in Exeter and Dr. J. C. Kelsey, Director of the Central Public Health Laboratory at Colindale. As a result, the Fund invited me to undertake the investigation, the terms of reference being:-

"To study the planning, administration and effectiveness of infection control in British Hospitals, with particular reference to the role of the Control of Infection Officer. "

1.2 Method of Collecting Information.

By correspondence with the Secretaries and the Senior Administrative Medical Officers of all the Regional Hospital Boards in England and Wales, Scotland and Northern Ireland a selection was made of some of the hospitals in which there was evidence of interest in the problems of infection control (Appendix A). The writer then visited the selected hospitals which were situated in England, Scotland and Northern Ireland. They included teaching and district hospitals as well as one mental one. The officers most concerned in the control of infection were interviewed - Control of Infection Officers and Control of Infection Sisters and Nursing Officers, clinical consultants, pathologists, matrons and administrators. In addition, the actual practice of the control of infection was watched as closely as possible to try to assess its efficiency. A Control of Infection Committee was attended and conversations were held with junior medical staff, theatre and ward sisters, technicians and others. Nearly everywhere, a great amount of thought and hard work had been and was being expended on one or other aspect of the work. As was expected, some of the organisations investigated appeared to work better than others but no deplorable practices were found.

As far as could be ascertained little or no attempt was made to exaggerate the better features or hide the less favourable ones.

Occasionally there was some initial reticence but once the purpose of the enquiry was understood there was no resistance in giving information. Much of the information was naturally given in confidence and for this reason the report is written so that the practices in individual hospitals cannot be identified. The report is an attempt to describe the findings as objectively as possible.

1.3 Definitions.

Control. According to the Oxford English Dictionary the word may be derived from the French contrôle, earlier contrerolle, "The copie of a roll (of account, etc.), a paraleil of the same qualitie and content with th' originall; also a controlling or overseeing". It can therefore have several meanings which include

1. The fact of controlling or of checking and directing action; the function or power of directing and regulating; domination, command, sway.
2. Restraint, check.
3. A method or means of restraint; a check.
4. A person who acts as a check; a controller
- and 5. (as in control - experiment) A standard of comparison used to check the inferences

deduced from an experiment, by application of the 'Method of Difference'.

Infection. In the scientific sense 'infection' is defined as the successful invasion of the tissues by microorganisms. The word is also used to denote the actual disease so produced.

1.4 Historical Precedents for the Control of Infection.

The concept of the control of infection is not new for about 1450 B. C. Moses laid down stern mandates on the disposal of waste, camp sanitation, the prevention of leprosy, the touching of unclean objects and eating of unclean foods (Leviticus, 13 to 15 and Deuteronomy, 14). In hospitals infections have been common for centuries. They were so rife that Ambroise Pare (1510-90) would not contemplate operating in the Hotel Dieu in Paris and in 1801 John Bell wrote in his Principles of Surgery that there is no hospital, however small, airy or well regulated, where this epidemie ulcer is not to be found at times; and then no operation dare be performed but in great hospitals especially it prevails at all times and is a real gangrene; it has been named the Hospital Gangrene. No expense should be spared do not grudge the revenue of the state for it is employing it and not abusing it if in the course of a few weeks sixty men die of the disease in your hospital, government has lost a sum which would

trebly buy your hospital itself". Some fifty years later Ignaz Semmelweiss (1818-65) markedly reduced the incidence of puerperal sepsis in one of his lying-in wards in Vienna by excluding doctors and students who had previously come directly from the dissecting rooms. His results infuriated his colleagues to such an extent that he resigned his appointment, became melancholic and eventually died in an asylum. About the same time Lister, by applying his antiseptic technique showed that hospital sepsis could be prevented. Since then many developments have followed - asepsis, hospital design, hygiene and antibiotics. But in spite of all these changes, infections still occur and spread in hospitals. A few far-sighted individuals have realised what was happening and made constructive suggestions for the control of infection. The charge given to the Sanitary Officer in St. Bartholomew's Hospital in 1897 (Appendix E) shows remarkable prescience. But it was the pioneer work of Leonard Colebrook in the middle of this century which potentiated the flood of work which has shown not only how infection spreads but that it can be controlled provided that everyone concerned takes it seriously and is willing to work to that end.

2. THE PROBLEM OF INFECTION CONTROL IN HOSPITALS

2.1 The presence of organisms in hospitals.

It is impossible to exclude organisms from hospitals. They are already there and more are constantly being brought in by patients, staff and in inanimate objects. Many of these organisms are pathogenic and sometimes produce infections. Ideally, therefore, they should not be allowed into hospitals and an efficient and alert Admissions Officer diverts many infected patients away from his general hospital to an Infectious Diseases one. He may, however, have to take the calculated risk of admitting a patient whom he knows to be infected and he then tries to find him accommodation from which he will not be likely to spread his organisms to others. In addition, any patient whom he admits, may have a latent infection or may be a carrier of pathogens.

2.2 The danger of pathogenic organisms in hospitals lies in the fact that they may colonise or infect both patients and staff. They are of many different species - cocci, diphtheria, anthrax, tubercle and intestinal bacilli, vibrios, spirochaetes, protozoa, moulds, viruses and rickettsiae. The resulting infections therefore take many forms and they spread in different ways. Infections acquired within the curtilage of the hospital are known

as cross-infections. They are not confined to surgical wounds but may affect the eye or the respiratory, urogenital, alimentary, or, indeed, any system of the body. They may, therefore, occur not only in the surgical and maternity wards but in any part of the hospital. It is to prevent such infections that the whole structure for the control of infection is directed.

2.3 The requirements of different hospitals vary widely so that the control of infection may be comparatively easy in one and extremely difficult in another. Modern hospitals with a high proportion of their beds in single rooms, positive-pressure ventilation in their operating theatres and central sterile supply departments present easier problems than old hospitals with wards accommodating up to thirty patients and without adequate washing facilities, isolation and central sterile supply departments.

3. THE STRUCTURE OF INFECTION CONTROL

3.1 The object is to exclude, as far as possible, the entry of pathogenic microorganisms into hospital and to prevent those which do gain access from producing infections and cross-infections.

3.2 The varieties of the structure of infection control.

The structure of infection control differs in almost every hospital so that the number of varieties almost equals the number of hospitals. Nevertheless, they conform to two main types which are related to, and influenced by, the fundamental differences in the general administration of the Health Service in England and Wales, in Scotland and in Northern Ireland.

3.3 The Government Departments and the Ministers.

The functions of the three departments in the different countries resemble each other in that they each advise their respective Minister but the names of both the departments which exercise control over the Health Service and the Ministers who are answerable to Parliament differ. Thus in England and Wales the Department of Health and Social Security (formerly the Ministry of Health) acts on behalf of the Secretary of State for Social Service (formerly the Minister of Health); in Scotland the Scottish Home and Health Department acts on behalf of the Secretary of State for Scotland and in Northern Ireland the Ministry of Health and Local Government

acts on behalf of the Minister of Health and Local Government. Besides advising their ministers on policy, these departments provide them with the information required for the preparation of new legislation, give instructions for the drafting of bills for submission to Parliament and frame regulations for subordinate legislation under Acts. They make public announcements, confer with local authorities, regional hospital boards and other bodies and issue circulars (instructional and hortatory) on subjects requiring explanation or action.

3.4 The Higher Management of the Hospitals (i. e. of General Administration) likewise differs in the three countries.

In England and Wales, fifteen Regional Hospital Boards constitute the regional planning and supervisory authorities to plan the development of the hospital service throughout their regions, to budget and to distribute the exchequer funds allocated and to supervise the expenditure of the Hospital Management Committees. They also cooperate with the local authorities and executive councils. As far as practical each board is associated with a University having a medical school. Some of the regions have a population of over four million.

In addition, there are Boards of Governors for the 36 teaching hospitals and of these 25 are in London. These draw

their finances directly from the central government. They can select their patients for the purposes of teaching or research. They are the descendants of the old major voluntary hospitals associated with medical schools.

In Northern Ireland the equivalent body is the Northern Ireland Hospitals Authority. It controls the teaching as well as the non-teaching or "area" hospitals.

In Scotland there are five Regional Hospital Boards whose functions resemble those of the ones in England and Wales except that (i) the bodies whose expenditure they supervise are not Hospital Management Committees but Boards of Management and (ii) they administer the teaching as well as the non-teaching hospitals. In drawing up their scheme for the constitution of the Boards of Management, each Regional Board had to consult with the university concerned as to which hospitals should be designated as teaching ones. University nominees are included in the membership of the Boards of Management of these hospitals.

3.5 The day to day management and control of the hospitals also differ between the three countries. In England and Wales there are 330 Hospital Management Committees and in Scotland 93 Boards of Management. The number of beds under each of the latter is about 600 which is much less than for the Hospital Management

Committees in England and Wales. In Northern Ireland there are 29 Management Committees.

3.6 The general and the medical administration within the hospitals differ in the three countries.

In England and Wales prior to their transfer to the National Health Service many of the regional hospitals had a Medical Director or Medical Superintendent. Many consultants regarded his presence as an infringement of their personal liberty and denigrated him. Admittedly any control does involve some infringement of liberty but the alternative to some measure of control is anarchy (Macaulay, 1954). In spite of this denigration, the Medical Superintendents continued to function after the transfer but when they died or retired most of them were not replaced so that there are now only about 84 left in general hospitals in England and Wales (Falla, 1968). In the mental hospitals, too, there has been a similar tendency to run down the post of Medical Superintendent so that their number in England and Wales is now only 161 (Falla, 1968).

Where the Medical Superintendent has been eliminated, the Chairman of the Medical Committee has taken over the medical administration and, along with the Matron and lay secretary, has formed a tripartite system of administration. This, however, has not adequately filled the vacuum left by the disappearance of the

Medical Superintendent and as prophesied by Macaulay in 1954 the vacuum is being increasingly occupied by lay administrators.

The Bradbeer Committee reporting on hospitals in England and Wales recommended (para 245 (5 to 9)) that in the smaller hospitals the medical administration could be undertaken by the Chairman of the Medical Staff Committee and an alternative for larger hospitals was the selection from among the existing consultants of one of their number as a medical administrator for a limited but renewable period and at no financial loss to himself. The Middlesex County Hospitals had such Medical Directors between 1929 and 1948. The system worked well and it had many advantages. Responsibilities were clearly defined and there was no danger that a medical administrator who was also a consultant in his own right could retreat into his office and eventually become out of touch with his colleagues. As long as he continued to function the medical administration could not become a mere part of the work of the lay administrator who only sought medical advice on problems of medical administration when he thought appropriate.

In Scotland a Medical Superintendent is responsible for the medical administration (Appendix D) in each hospital or group of hospitals. He is invariably a member of the staff of the Regional Hospital Board. Following the Henderson Committee's recomm-

endation, the traditional Scottish practice of the Matron being on the Medical Superintendent's staff has been replaced by a partnership founded on mutual understanding and cooperation and the lay administrator is now responsible to the Board (of Management) and no longer to the Medical Superintendent for those departments in which lay interests predominate and these vary according to local circumstances.

Medical Superintendents were formerly recruited largely from the Indian and Colonial Medical Services and from Local Authorities. Most of these doctors therefore had a good working knowledge of infectious diseases and how to control them but only a small proportion of them had a D. P. H. The Henderson Committee regarded the D. P. H. as a very useful background training for Medical Superintendents by giving them a good general understanding of social medicine and administrative methods but they did not consider that there should be any requirement on future Medical Superintendents to obtain a D. P. H. before entry into an administrative post in a hospital.

The Indian and Colonial Medical Services are now becoming exhausted as sources of recruits. A training scheme in administration was therefore started in 1965 by the Scottish Hospital Administrative Staffs Committee at Woodburn House in Edinburgh.

Three Fellows (formerly Trainees) are now selected annually for the three-year course. The first year is spent at the University of Edinburgh in studying for the Diploma in Social Medicine which has recently been accepted as registrable by the General Medical Council. Candidates for this academic course should have had at least two years postgraduate experience after full registration and the period of study is full time for one academic year. The syllabus includes the principles and methods of epidemiology and the prevention and control of communicable and non-communicable diseases. Having acquired this basic training, the Fellows spend the two subsequent years of the administrative course in attachments to one of the Regional Hospital Boards, secondments to a Group Medical Superintendent and working on projects.

This Scottish system of medical administration has two possible weak points. First, not enough men of good calibre may be found to fill the posts between the retirements of the ex-Indian Medical Service and ex-Colonial Medical Service Officers and the completion of the training of the Fellows by the Administrative Staffs Committee. Recruitment of suitable trainees might be helped by raising the salary scale of the Medical Superintendents to that of consultant. Second, there is a danger that the Medical Superintendent without clinical responsibility may become an office-worker and out of touch with his colleagues (Macaulay, 1968).

In the mental hospitals in Scotland the Medical Superintendents number 29 (Falla, 1968). They differ in both training and function from the Medical Superintendents of the regional hospitals, for they are Consultant Psychiatrists who bear the additional responsibility for the medical administration of their hospitals.

In Northern Ireland the "area" hospitals resemble the district hospitals in England and Wales in not having Medical Superintendents but the two large hospitals in Belfast each have a Medical Superintendent in their establishment.

3.7 The administrative structure specifically directed to the control of infection in England and Wales. The Ministry's recommendations are contained in the Procedural Memoranda No. 1 and No. 1A and the Report of the Cohen Committee. These envisaged the appointments of a Control of Infection Committee (Appendices B, F and G) and of a Control of Infection Officer (Appendix C).

Some consultants were actively opposed to these proposals and many hospitals were slow to act on them. Gradually, however, appointments were made but the terms of the appointments often differed markedly from the Ministry's recommendations especially in the function of the committee (chapter 10) and the authority of the officer (chapter 11).

3.8 The Control of Infection Officer in England and Wales.

All the hospitals visited in the investigation have one individual who is recognised as the one to whom all questions relating to the control of infection are referred and who is available to give advice as to the necessary action. In the regional hospitals this individual holds the appointment of Control of Infection Officer from the Medical Committee so conforming to the recommendation of the Cohen Committee but the committee to whom he is immediately responsible is rarely defined.

The C. O. I. Officer must be of consultant or academically equivalent status. Otherwise he may be ignored by some of the consultants. The Bacteriologist is usually appointed but in the Exeter area it is traditional to have a clinician.

One district hospital has an unusual arrangement whereby a triumvirate of three consultants - the bacteriologist, a physician and a surgeon - carry out the duties of the C. O. I. Officer.

The post of C. O. I. Officer has thus far invariably been an unpaid one held by a consultant who has the commitments inherent in the post to which he was appointed. A recommendation, however, has been accepted in principle by the Eastern Regional Board for Scotland to have an additional full time "Control of Infection Consultant" for the region and based at Dundee. The appointee

should have had bacteriological training and would be given nursing, technical and secretarial assistance. He would have access to hospital records, bacteriological reports and wards. He would have authority to take specimens (but not remove dressings) and would be provided with laboratory space and equipment.

3.9 The administrative structure for the control of infection in Scotland. No administrative structure has been set up specifically for the control of infection alone. Such was deemed unnecessary because the content of medical administration (Appendix D) includes the essential duties of the C. O. I. Officer viz. the coordination of measures to prevent the spread of infection in the hospital and the investigation and control of any outbreaks of epidemic disease or cross-infection within the hospital in association with the local Authority where necessary. With such duties ascribed to the Medical Superintendent the specific appointment of a separate C. O. I. Officer would be superfluous and indeed, in the present project there were C. O. I. Officers in only two of the Scottish hospitals visited and these hospitals were among the few in which the Medical Superintendent did not hold a D. P. H. It may therefore be that when the Medical Superintendent has a D. P. H. little need is felt to appoint a C. O. I. Officer.

The Medical Superintendent frequently delegates a greater

or lesser part of his duties concerning the control of infection to the Bacteriologist but the ultimate responsibility for any action required remains his own.

Whether the Medical Superintendent possesses a D.P.H. or D.Soc. Med. or no such diploma at all his training and experience has invariably given him considerable knowledge in the control of infection. His presence in the hospital or group of hospitals is therefore equivalent to the hospital having a part-time Medical Officer of Health on its staff for its exclusive benefit.

The usual arrangement is that the bacteriologist maintains a surveillance over the infections as shown by his bacteriological findings and discusses any sign of cross-infection with the clinicians and with the Medical Superintendent who has both the knowledge and executive powers for any action required.

3.10 The teaching hospitals on both sides of the border usually, but not invariably, have no formally designated C.O.I. Officer. In them the bacteriologist simply carries out the duties without any formal appointment. The senior bacteriologists on the academic staff usually hold honorary appointments from the Board of Governors in England or Regional Hospital Boards in Scotland and conversely the consultant bacteriologists appointed by, and paid by the Boards of Governors and the Regional Hospital Boards hold

honorary appointments from the University or Medical School. In either of these arrangements there may be several (sometimes as many as four) consultant bacteriologists in one hospital and in such a case each of them is allotted to a "parish" of approximately 250 beds within the hospital.

St. Bartholomew's Hospital has a unique arrangement whereby the Professor of Bacteriology is appointed "Sanitary Officer". This office dates from February 1892 and has been held by a succession of distinguished individuals - Sir Frederick Andrews, R.G. Cantl, Professor L.P. Garrod and (presently) Professor R.A. Shooter. The charge of the office (Appendix E) is couched in the language of the period and is a testimony to the foresight of the members of the House Committee who formulated it.

The relative merits of the administrations by the tripartite arrangement and the Medical Superintendent are discussed later (chapter 11).

3.11 Advisory Panel in Epidemiology. Formal enquiries are usually held after the occurrence of avoidable infections such as gas gangrene necessitating the amputation of a young man's leg or a fatal case of tetanus. The Senior Administrative Medical Officer of the Regional Hospital Board usually appoints an ad hoc committee consisting of several senior bacteriologists to ascertain

the cause of the outbreak and put forward measures to prevent a repetition. At these enquiries it is rare to identify a real villain of the piece. What emerges is a little insufficiency here or a bit of passing of responsibility there and nothing which might not be accepted as everyday procedure.

After an outbreak in which serious defects were found in the arrangements to control infection, one Regional Hospital Board appointed a Standing Advisory Panel in Epidemiology to advise the Board in matters specifically related to the prevention of infection. The Panel was given wide power to review the structure for infection control throughout the region, to ensure that it is properly organised and to keep the position constantly under review. Suitable members for such a panel would include a Professor of Bacteriology, an experienced Pathologist whose main interest is Bacteriology, the Consultant in Infectious Diseases, the local Medical Officer of Health and an Assistant Senior Administrative Medical Officer of the Board.

4. THE ACTIVITIES OF THE CONTROL OF INFECTION OFFICER

4.1 The Control of Infection Officer is usually the bacteriologist of the hospital or group of hospitals. When this is so, his work consists of:-

Consultant work (para 4.2)

The Microbiological Service (para 4.3). This includes the administration of the microbiological department (para 4.4)

and The Control of Infection (para 4.5).

4.2 As a consultant, the Bacteriologist consults with his colleagues on individual patients. He advises on the specimens to be taken; he interprets the results of his examinations and he discusses the treatment.

4.3 The Microbiological Service.

The Bacteriologist is responsible that the specimens submitted to him are examined appropriately and that the reports are issued without delay.

The service should be available over the whole 24 hours.

Many new methods have been introduced since the Second World War. Virology has been added to bacteriology to become microbiology but, for the control of infection, virology is less important than bacteriology because patients with viral infections

have either recovered or died by the time the laboratory tests have been completed.

The laboratory now plays an important role in the control of treatment in addition to diagnosis. Many antibiotics are now available and some of the organisms against which they have been directed have developed resistance. Multiple sensitivity tests are, therefore, required.

For the control of outbreaks, the exact identification of many organisms forms the only rational basis. Phage-typing is, therefore, used for staphylococci ^{and} salmonellas ~~and Pseudomonas~~; grouping and typing for streptococci, serological tests for Pseudomonas and colicine typing for Shigellas. Fortunately the bacteriologist can limit the number of tests required. The strains of staphylococci isolated, for instance, can be maintained in a bank and only those whose identity is necessary are phage-typed.

For the diagnosis of smallpox, special laboratories are designated throughout the country (Diagnosis of Smallpox Memorandum, 1963) and practitioners with experience of the disease are designated to help Medical Officers of Health in its diagnosis (Memorandum on the Control of Smallpox, 1964).

In this investigation the laboratory services were invariably efficient. The smaller hospitals are served by large laboratories situated at a distance from them but a flying squad consisting of a

bacteriologist and a technician is ready to go with equipment at short notice to help them or general practitioners.

The laboratory services are organised differently on the two sides of the border. During the second World War the Emergency Public Health Laboratory Service was organised and administered for England and Wales by the Medical Research Council. The present Public Health Laboratory Service is its permanent successor and was started in 1945. It is administered by its own Board. In addition to the Central Laboratory at Colindale (which contains reference laboratories) it has 61 constituent laboratories. Some consultant bacteriologists employed by Regional Hospital Boards in the Hospital Service are associated on a part-time basis with the Public Health Laboratory Service and an increasing number of laboratories of the Service are taking over the clinical bacteriology of regional hospitals. This arrangement by which a public health laboratory is associated with the hospital is economical by avoiding duplication of both laboratories and staff.

The Public Health Laboratory Service has an important function in distributing vaccines and sera on behalf of the Department of Health and Social Security.

In Scotland the bacteriological services are provided by the Regional Hospital Boards and the laboratories are centred on the four University Medical Schools with a special arrangement for

Inverness and the north. They are self-contained but give mutual help when required. They provide the services for hospitals, medical clinics of all types, public health departments and the general practitioners.

4.4 Administration of the Microbiological Department.

The Bacteriologist is in charge of medical, technical, clerical and possibly domestic staff. With experience and hard work he can build up an efficient and contented department. He ensures that the junior medical staff receive adequate technical and administrative training for the examinations of the College of Pathologists and he encourages them to publish original observations. Likewise, he ensures that his junior technicians are prepared for the examinations of the Institute of Medical Laboratory Technology.

Outside his department, he has to attend committees of which the Medical Staff and the Control of Infection Committees are inescapable.

Outside his hospital he may have to sit on Group and Regional Advisory Pathological Committees and Advisory Appointment Committees of the Regional Board. As he becomes senior he may serve on the Central Pathology Committee and various joint working parties, such as those set up to advise on technical subjects or the training of technicians. If he is Director of one of the Laboratories of the Public Health Laboratory Service he has to attend the monthly meetings of the directors.

Microbiology is a rapidly advancing subject and so microbiologists have to read their esoteric journals and attend the meetings of the learned societies.

4.5 The Control of Infection.

The work entailed may constitute a heavy load on the Bacteriologist who is already well occupied with the duties for which he was appointed. The more efficiently infection is controlled, however, the less the time should be required for it.

Estimates of the time required vary widely and depend on how the work is organised and on the state of infection in the hospital at the time. According to May (1957)

Once the organisation has been set up the amount of time that need be spent on this aspect of a Consultant's work is not excessive. Naturally it would vary according to whether an outbreak of infection is in progress, but under normal conditions a quarter to half an hour each day is adequate to make sure that no serious cases of coccal infection have gone unnoticed.

This estimate may be accurate if the C. O. I. Officer merely scans the bacteriological reports as they become ready for despatch from the laboratory each morning. If, on the other hand, he is expected to visit the forty wards of a large hospital and discuss with the doctors and ward sisters the patients who give signs which may

indicate infection, the estimate is not realistic.

The C. O. I. Officer often has to spend much time in trying to secure implementation of his recommendations for the transfer of a patient to isolation. This is largely due to the lack of executive authority (chapter 11) and the tripartite system of general administration of the hospital (para 3. 6).

In Scotland the Bacteriologist merely makes his recommendations and is not held responsible for its implementation.

4. 6 The need for assistance for the C. O. I. Officer.

If the report of the Royal Commission on Medical Education (1965-68) is implemented, district hospitals will seldom have less than 800 beds and will serve a population of about 150,000. Even with adequate technical and clerical staff a bacteriologist of such a hospital will be fully occupied in the supervision of his department. To act as C. O. I. Officer in addition, additional help will be necessary. This may take one of several forms - another consultant bacteriologist or senior registrar for bacteriology or extra staff specially designated for the control of infection, i. e. a medical assistant, a Hygiene Officer, a Control of Infection Sister or a Control of Infection Nursing Officer.

4. 7 Medical Staff for the Control of Infection.

Teaching hospitals have often more than one consultant bacteriologist and they are either consultants employed by the Board

of Governors or University Professors, Readers and Lecturers holding honorary consultant contracts from the Board. (para 3.10). In one of the hospitals visited, a married woman doctor holds a part-time clinical assistant appointment specially for the control of infection. This is a highly successful arrangement but for the fact that her experience would justify her grading as a consultant.

Many district hospitals now have a senior registrar for bacteriology and the appointment is usually linked with a medical school so that the senior registrar spends say the first two years in the district hospital, the third in the teaching hospital and if he has not secured a consultant post by then, returns to the district hospital. During his secondment to the teaching hospital, the latter is usually able to lend the district hospital a lecturer as a replacement and the scheme is beneficial both to the Senior Registrar and the Lecturer. The application of laboratory results to the practical control of infection throughout a district hospital is a valuable experience for both these trainee bacteriologists whether they are destined to become consultants in district hospitals or Professors of bacteriology in a medical school. These trainees, like senior house officers and registrars, are usually occupied with research for an M. D. Thesis and, as far as the control of infection is concerned, may be more of a liability than an asset until they have gained experience.

4.8 The Hospital Hygiene Officer in St. Andrew's Hospital, Bow, London, E.3. is a unique appointment specific for the control of infection and it is not to be confused with the Hygiene Officers appointed by some Management Committees for duties more akin to those of a Public Health Inspector. The pathologist there holds that inadequacies in the efficiency of sterilisation and dressing techniques are rarely a major cause of cross-infection and that cleaning, laundering techniques, air hygiene and kitchen hygiene are more important (Steingold, 1964). He believes that a Control of Infection Sister would concentrate on sterilisation and dressing techniques and the recording of infections. Further there is a scarcity of nurses and they should not be diverted to Control of Infection duties. In 1958, therefore, with the aid of a grant from the North-East Metropolitan Regional Hospital Board a trained bacteriologist was appointed as a full-time Hygiene Officer and as this first experiment was successful, the Management Committee made the appointment a permanent one. The present occupant of the post is a Bachelor of Science with Honours in Microbiology. In addition to regularly testing the efficiency of the sterilisers and the sterility of equipment he tests the bacterial content of air, keeps records of infections, phage-types the staphylococci and visits wards, theatres and kitchens. His undoubted success is due to his personality and common sense and the good relations between

the pathologist and himself on the one hand and the rest of the hospital on the other.

There is no official grading for a Hygiene Officer and he is therefore designated as a non-medically-qualified biochemist and physicist (para 4.15).

4.9 The control of Infection Sister (I. C. S.). The first I. C. S. was appointed at the Torbay Hospital in 1959 (Gardner et al., 1962) and another in Brisbane in 1962 (Davis et al., 1963). There are now about twenty in England and Wales, one in Scotland and two in Northern Ireland and approval is being sought for further appointments. Similar appointments but with different titles are common in the United States.

4.10 The Control of Infection Nursing Officer (C. O. I. N. O.)

The traditional divisions of the nursing services into male and female sections are being unified for the needs of psychiatry and administrative efficiency and so men and women of the nursing staff are now in many ways interchangeable (Report of the Salmon Committee, para 7.19). Thus Control of Infection Nursing Officers are to be found especially in areas which have a large mental hospital. They are the male equivalent of the I. C. S.

Neither I. C. S. s nor C. O. I. N. O. s are mentioned in the report of the Salmon Committee.

4.11 The functions of the I. C. S. were classified by Gardner and his colleagues (1961) as follows:-

1. Collection and preparation of adequate records.
2. Prompt recognition and disposal of infected patients.
3. Improvement of the liaison between Matron and the ward sisters.
4. Checking performance of ward techniques.
5. Supervision of infections records.
6. Routine checks of staphylococcal carrier-rates in operating theatre staffs, assessments of environmental contamination, efficiency of preventative measures and research investigations.

According to Bradbeer and his colleagues (1966) the duties of the I. C. S. embrace the keeping of a desk diary containing details of infected patients compiled from the ward admission books and ward diaries, discussions with the ward sister, abstracts from the patients' notes and the laboratory records. When cross infection occurs the I. C. S. collects more detailed information on ward procedures, location and bed movements of the infected patients and the relevant data are entered on record cards. She also keeps a record of infections of the nursing and domestic staff. She has discussions with a wide cross-section of the hospital staff, interprets laboratory reports, collects specimens for laboratory

examination and helps in the operational trials of new techniques.

4.12 The Terms of Appointment of the I. C. S.

There is general agreement that the I. C. S. should be on the staff of the Matron and this implies that the Matron must be in agreement with the appointment. The appointment of an I. C. S. to the staff of the Medical Superintendent in a Scottish Hospital was not successful. The status of the I. C. S. is usually that of a ward sister because if she were an Assistant Matron, she might give ward sisters and theatre sisters the impression that she was watching and criticising their every action. This would not be conducive to good work. The rank of Assistant Matron, too, might encourage ward sisters to apply for appointment as an I. C. S. for reasons of advancement rather than because of an interest in the work and the promotion of a ward sister to Assistant Matron within her own hospital might arouse jealousy. One hospital tried unsuccessfully to second one of the Assistant Matrons and then each of its Assistant Matrons in rotation every six months for duty as the I. C. S. An I. C. S. does not learn her duties without some months experience and not every Assistant Matron is interested in the control of infection.

The regular hours and absence of night work make the post attractive for a married nurse either before she starts a family or after her family commitments have lessened.

The appointment is usually a full-time one.

In the centrifugal parts of the country, the I. C. S. should be able to understand and speak the local dialect.

An I. C. S. must be interested in the control of infection, and should have a wide experience as a ward sister or theatre-sister and preferably with some specialised knowledge such as midwifery, paediatrics or fevers. The wider her experience the more likely she is to be acceptable in the different departments of a large hospital.

4.14 The arguments (a) for and (b) against the appointment of an I. C. S.

The arguments in favour of appointing I. C. S. s need to be cogent to justify employing so many highly-trained sisters who are already too few in number, in what is mainly non-nursing work. There are 330 hospital groups in England and Wales, 93 in Scotland and 29 in Northern Ireland and if each were to appoint one I. C. S. at salaries between £890 and £1,205 p. a. (para 4.15) the expenditure in both nursing personnel and salaries would be considerable. Further, the I. C. S. by taking a large number of specimens for examination inevitably increases the expenditure of the laboratory.

It is uneconomic to appoint an I. C. S. unless there is a reasonable expectation that she will be fully occupied on work commensurate with her specialised training and expertise. If there is doubt that there will not be sufficient skilled work to justify a full-

time appointment, a part-time one should be considered. There is also the possibility that an I. C. S. could be employed on short surveys over 1 to 2 years to provide answers to problems of infection as they arise and the surveys could be dropped if there was no cross-infection.

(a) In this investigation the appointments of two I. C. S. s were not successful. In each of these both the terms of the appointment and the choice of the individual had been unfortunate. Apart from them, there was support which was sometimes enthusiastic, for the I. C. S. wherever one had been appointed. One matron said that if her establishment had to be reduced the I. C. S. would not be the first to go and she indicated that she had deputed her responsibility vis-a-vis infection to the sister. An active I. C. S. is a means of maintaining an interest in the control of infection throughout the hospital and of ensuring that the standard of technique does not decline. She is a great help to the C. O. I. Officer, and her work is important in that she seeks out information whereas the unassisted C. O. I. Officer has at best only a retrospective record to use for his surveillance. There are other aspects of her work which cannot readily be done by anyone else. She has the necessary time, for instance, to investigate occurrences in the theatres and wards and with her additional knowledge of bacteriological methods, she can ensure that the right specimens are taken in the right form and at the

right time. She can undertake routine monitoring of the hospital and especially of the disinfection of equipment such as respirators and breathing machines. Their disinfection is difficult and the responsibility for them is rarely defined. When one of the staff is infected, she can form a useful contact between the hospital and the general practitioner and she can help in unravelling the sequence of events in actual outbreaks. If a patient develops an infection after his discharge from hospital, she can try to determine the source of the infection.

When she meets matron each week she can offer constructive suggestions on the use of new techniques or materials or departures from the orthodox nursing procedures.

(b) In Scotland the consensus of opinion among administrators, bacteriologists and sisters is that I. C. S. s are not necessary and the hospitals there ^{do not have an undue amount} ~~appear to avoid outbreaks~~ of cross-infection without employing them. Many of the functions of the I. C. S. (para 4.11) are normally carried out by other members of the staff. Thus when the results of the bacteriological examinations are used as the records of infection they can be classified according to the wards and main organisms much more economically and just as efficiently by an intelligent clerk than by a highly-trained sister. The recognition of infection among patients is the joint responsibility of the ward-sister and the bacteriologist. The surveillance of the infection record is one of the chief duties of the

C. O. I. Officer and need occupy very little of his time (para 9.3).
 An efficient and kindly matron does not need an I. C. S. to improve the liaison between herself and her ward sisters. The Clinical Instructor is the appropriate individual to check the performance of ward techniques and to teach the recruits to the nursing staff and newly-appointed housemen. The responsibility for preventing cross-infection in the ward is on the ward-sister and it should not be possible for her to pass her responsibility on to the I. C. S. Sharp demarcation of responsibility is essential for efficiency and if the sister observes an infection in her ward, she has the right and duty to approach the bacteriologist directly for help.

4.15 Salary Scales for additional staff for the control of infection.

	<u>Minimum</u>	<u>Maximum</u>
Consultant	£3,200	£4,885
Medical Assistant	1,850	3,250
Senior Registrar	1,950	2,550
Assistant Matron	1,145	1,360
Departmental Sister) Ward Sister)	890	1,205
Probationary Biochemist	935	1,175
Probationary Physicist	830	1,175
Post-probationary Biochemist & Physicist	1,010	1,610
Principle Grade Bu Biochemist & Physicist	2,255	2,900

Medical Superintendent
(Scotland)

£2,270

£3,430

4.16 Orthodox Procedures and Personal Relations.

The duties and responsibilities of the C. O. I. Officer necessitate his contact with a very high proportion of the hospital staff - doctors, nurses, administrators, technicians, engineers, and the catering, laundry, domestic and portering staff. As far as the control of infection is concerned, he is the one individual to co-ordinate their activities. He therefore must exercise skill and take into account their different capabilities, functions, powers and outlooks. His methods must be practical. Good relations are essential.

An outbreak of infection is a worry to clinicians, pathologists and administrators and can cause ill-feeling and quarrelling. A clinician with responsibility for the consequences of infection may know neither the ways in which organisms spread nor the state of infection in his ward. He therefore cannot decide on what action he should take. His anxiety may make him difficult and unreasonable. If he is senior, he upsets his staff so that their work deteriorates. Even an individual with less responsibility can disrupt the work of the whole team of which he is a member.

As long as antiquated wards and obsolete theatres and equipment have to be used, cross-infection is bound to happen sometimes and it is not necessarily a reflection on the doctors and

nurses. When it occurs people who are on top of their jobs - be they clinicians or Control or Infection Officers - show neither panic, disorder nor confusion but remember that both technical and administrative help is always available. There is no excuse, therefore, for trying to ignore or hide the warning signs of an outbreak in the hope of an epidemiological miracle. Such miracles do not happen. It is infinitely preferable to take, at an early stage, precautions which eventually seem not to have been needed than to take no precautions at all and let an outbreak develop which may bring needless suffering, deformity and death to patients and itself be really difficult and expensive to bring under control. An outbreak does not follow every failure to take precautions. Anyone who develops a false sense of security on this account and thinks that his luck will hold indefinitely and that he need not bother to adopt the measures known to secure safety for his patients is living in a fool's paradise.

Unfortunately there is evidence that some of the medical staff need to be told yet again the orthodox procedure to adopt when they have reason to believe that cross-infection has occurred. They should, in the first instance, consult the bacteriologist (and the C. O. I. Officer if he is not the bacteriologist). Conversely the bacteriologist should approach the clinicians. He is responsible for investigating the outbreak (paras 9.3. & 4). If a defect is

found, the essential action is to have it remedied as soon as possible and without revealing to more people than is necessary the need for change. If difficulties arise, help should be sought from the wisest and most experienced doctor within the hospital or from the medical staff of the Regional Hospital Board.

Help should also be sought from outside the hospital when smallpox is suspected. The Medical Officer of Health should be informed and he can obtain the advice of a doctor recognised and designated as an expert for the diagnosis.

Personal relations can be gradually improved and the morale of hospitals built up. Appointments Advisory Committees take pains to recommend for appointment candidates with the best qualifications, knowledge, publications and clinical or technical ability but it is equally important that the appointee should have proved himself able to work amicably as a member of a team. Ideally individuals should be chosen for jobs which are neither too demanding for their capabilities nor too little stimulating for their talents. Individuals already in appointments might with advantage take stock of their personal relations with their colleagues and have a heart-searching reappraisal of their own attitudes and behaviour. Good manners and an acceptable code of behaviour are pre-requisites for good relations.

By far the most successful methods for the control of

infection which have been encountered in this investigation have been established on easy relationships allowing of completely informal talks which produce agreement between the C.O.I. Officer and the clinical staff and result in rapid and useful action.

4.17 Relations with the Press.

Unauthorised statements to the Press on an outbreak of infection usually consist of an account of the sequence of events as seen by the speaker only. They are therefore often ill-balanced and may conflict with official descriptions based on a knowledge of all the available facts. Discrepancies between conflicting accounts in the press give rise to alarm and despondency. They can be avoided by recognising one individual in the hospital as the authorised contact with the Press, by informing the Regional Hospital Board of all the relevant facts and by maintaining good relations with the local Press.

5. RECORDS OF INFECTION

5.1 The Purpose of Records. Many records are probably kept without any idea of the purpose to which they are to be put and some of them are rarely if ever put to any practical use.

5.2 The Cohen Committee said that records were needed to provide information for 3 purposes (Appendix H). Of these, those labelled (a) and (c) are not suitable as part of a routine procedure. To assess the efficiency of the regular preventive measures in use, to judge the desirability of introducing special measures and to assess their efficacy involve major research undertakings if the results are to be of any value. They require the full time of a research worker specifically appointed for the investigation. The Medical Research Council is at present investigating nasal carriers of staphylococci in two hospitals which have new surgical blocks and Regional Hospital Boards have sponsored experiments such as those undertaken some years ago in Dundee and by Mrs. K.A.B. Williams, Ph.D. in Inverness.

Lidwell (1963) in a statistical and Quasi-statistical discussion on the planning and evaluation of cross-infection studies emphasised the importance of four topics - the dose-response curve, the number of observations required, the problem of multiple factors and the necessity for a control group. He also

(1969) maintains "that the collection of records is only a time-wasting exercise unless some use is made of them and that comparative studies of anti-infection methods become very difficult, owing to the large numbers of patients who must be observed, when infection rates are low".

Impressions on the incidence of infection are often misleading and are therefore unreliable. In contrast a faithfully kept record can be relied on because a rise in their incidence can be taken as an early warning of the existence or impending spread of an outbreak (Purpose "(b)" in para. 56 of the Cohen Report). Prompt action can then be taken to prevent an infection spreading. In newly designed wards with 20% to 40% of the beds being in single rooms, a patient showing the least suspicion of an infection can be immediately isolated and this reduces the urgency for other immediate action. In contrast, in the still common 26 to 30 bedded ward with little or no facilities for isolation the chance of spread of infection and the need for constant surveillance are correspondingly greater.

A secondary purpose of keeping a record is to enable the Control of Infection Officer to fulfil the function allotted to him in para. 161 of the Cohen report viz. "to keep the responsible members of the hospital staff informed of the incidence of sepsis". He can do this in one of several ways (para. 8.1).

5.2 The information required need not be voluminous. It should not contain more than is provided for in Table II of the Cohen Report. Such information is much easier to record at the time of the event than later when its collection would entail searching through numerous individual case notes.

It is particularly important to keep adequate records of infections among the hospital staff.

If an outbreak should occur, much information can be condensed into little space by construction of a "calendar" which shows at a glance the main course of events (Gray et al 1962). The recording of information on punch cards as described in the same paper is more suitable for a research project than for routine.

5.3 Definition of Infection for entry in records.

A tight stitch in a sterile wound, especially after a gynaecological operation, may delay its healing and cause a slight serous discharge. An over-enthusiastic dresser may regard this as an infection. Conversely, a septic wound may on swabbing fail to yield a growth of a pathogenic organism. Further, the presence of saprophytic organisms in a wound does not necessarily impair healing. For these reasons, it is essential to have recognised criteria for recording infection in a wound as has been done in St. Mary's General Hospital, Portsmouth (Appendix J.). Further, if an

account of an outbreak is to be published, these criteria should be described in it. Otherwise such publications are not comparable with each other.

The records of infection should not be confined to infections of wounds. Staphylococcal infections in medical and maternity wards and babies nurseries should be recorded as well as diarrhoea from any cause in children's wards.

5.4 Who should compile the record? The Cohen Report (para. 67) says that "The nursing sister in charge of a department or ward is usually the most suitable person to keep the C. O. I. Register or its equivalent. This has obvious advantages when more than one clinician is responsible for patients under treatment in the unit"

The arrangement suggested may be possible in a ward with a small number of beds or with a leisurely turnover of patients but it is not practical in an acute surgical ward with a rapid turnover and a high proportion of patients needing skilled nursing. The Salmon Committee in para. 4.22 of their report recommend that no more time of the ward sister should be spent on administrative work than is really necessary and suggest the use of a part-time receptionist or ward-aide to relieve her of her non-nursing, non-teaching and non-managerial duties. If the responsibility for

keeping a record is placed on the sister there is a considerable chance that even a conscientious sister will make her entries from memory at the end of the week. This largely defeats the purpose of the register. Neither housemen nor students are suitable. Both vary in their reliability and the former change every six months and the latter usually every three months. If records are to be kept on the wards there remains the possibility that they be kept by the Infection Control Sister or the Control of Infection Nursing Officer (para. 4.11).

5.5 Records made on the wards. In all the hospitals visited, infections are recorded in the patients' notes but the keeping of records on the wards additional to these entries is exceptional. St. Mary's General Hospital, Portsmouth is an example of one which does so. It uses for the purpose a lay-out identical with that recommended by the Cohen Committee (Table II of their report) except that there are additional columns for the consultant's remarks and initials. The Cohen Committee also suggested, as an alternative, adapting the ward Admission and Discharge Book whereby notes can be entered about any infection which occurs (para. 66) but this method is not in general use.

In hospitals where Infection Control Sisters have been appointed, they keep records for the Control of Infection Officers and themselves, which, if any, of these methods for keeping

records is adopted, their maintenance on wards is possible only if the consultant in charge actively supports the idea. If he does not do so and especially if he denigrates its importance, his staff will assuredly not keep records accurately if at all.

5.6 Records compiled by notifications. The Ministry's Procedural Memorandum No. 1 (195) recommended that the Matron should receive a weekly statement of all infections in the wards. Reports of the incidence of infection among hospital staff other than ward staff should also be made weekly to the appropriate officers. The P. M. 1 gave a suggested form for the notification and a list of the infections to be notified. These recommendations were based on the principles laid down in the Medical Research Council's Memorandum 11 (Revised edition 1951).

If this method of compiling a record of infection were to be used alone the matron and the C. O. I. Officer would not learn of some of the infections for at least a week after they had occurred by which time the pathogenic organisms might have been widely dispersed. A revised method was therefore tried in many hospitals whereby the notifications as they occur were sent on pre-printed forms by each of the wards and departments either to the Matron and thence to the C. O. I. Officer or to the latter direct. The method involved additional clerical work on the wards and its success depended, like that of other schemes, on the attitude of the

chief in charge of the ward and on the conscientiousness of whoever had the duty of completing and despatching the forms. The method has nearly always been abandoned because only a proportion of the infections which occurred were actually reported although some of the housemen who were made responsible were most conscientious. Others, unfortunately, were less reliable.

5.7 Laboratory Registers. All the laboratories keep records of their results. Sometimes these consist merely of the results of the microbiological examinations of the specimens submitted filed according to the patients' surname. Other laboratories compile in addition a weekly return of infections for each ward (or hospital) and this is subdivided according to the organisms mainly responsible for cross-infection, viz. staphylococci and other cocci, Bact. coli, Proteus and Pseudomonas. Such returns are of great practical value for giving early warning of incipient outbreaks (para. 5.2). This system minimises as much as possible difficulties arising from the laboratory being situated at a distance from any hospital which it serves. In other hospitals the pathologist's secretarial staff use peg boards or card indices to show the occurrence of infections in each of the wards.

Records based on the results of microbiological examinations alone have two disadvantages. First, they are incomplete.

They do not include infections from which specimens have not been sent to the laboratory. Consultants in clinical charge of patients sometimes prescribe antibiotics at the first evidence of an incipient infection and do not take a specimen for examination. The laboratory-compiled records likewise do not include infections from which the growth of organisms has been prevented because antibiotics have been given before the specimen was taken. Second, the information cannot be entered in a laboratory register until at least part of the microbiological examination has been completed. For this reason, laboratory registers are necessarily compiled later, usually by one or more days, than records based solely on clinical observations of the patients.

6. RESPONSIBILITY FOR INSPECTION

6.1 The responsibility of the Control of Infection Officer.

The C. O. I. Officer is responsible not only for co-ordinating the measures to prevent cross-infection but also for keeping watch on any activity which may interfere with the prevention in any way. Many activities of the hospital are therefore concerned and they include (1) the general cleanliness of the hospital which is the responsibility of the Domestic Supervisor, (2) the catering department including stores, preparation rooms and kitchens which are the responsibility of the Catering Officer, (3) the laundry which is the responsibility of the Laundry Manager, (4) the maintenance of the autoclaves which is the responsibility of the Engineer and (5) the working of the autoclaves which is usually the responsibility of the Superintendent of the Central Sterile Supply Department and the Theatre Superintendent.

The C. O. I. Officer has no responsibility for the efficiency of these different activities. He has, however, responsibility to ensure by inspection and various tests that they are efficient. When he finds a defect, it is his duty to tell the officer concerned and see that the defect is righted with all possible speed. For the smooth discharge of this responsibility the C. O. I. Officer needs tact and good manners and has to foster good relations. He should, if possible, only inspect a department other than his own, in company

with the head of the department and he should try to show that his intention is not to find fault but to offer help by way of constructive suggestions for the benefit of the service.

6.2. The Responsibility of the lay Administrator

The lay administrator has an overall responsibility for the work on his staff - domestic supervisor, catering officer, laundry manager and engineer. He therefore plays an important though indirect role in the control of infection. He can help to maintain the morale and vigilance of the hospital team as a whole. For this he must have trained, intelligent and co-operative staff. He must therefore exercise skill in selecting suitable individuals, training them (probably enlisting the help of the bacteriologist) and stimulating an esprit de corps by encouraging them to use their initiative and by making only reasonable demands on them. Frequent inspections are necessary and when he and his staff cannot themselves correct a defect found, he should report it with suitable recommendations for its correction to the committee to which he is responsible. He must not tolerate deplorable conditions just because "there is no money".

6.3 The general cleanliness of the hospital.

Keeping the walls, windows and floors of the hospital clean may, from the bacteriological standpoint, only irritate the resident flora on them but it does contribute to the cleanliness and

pleasantness of the hospital environment. Staff, patients and visitors are less likely to leave litter in a clean and tidy building than in one in which dirt and dust have been allowed to accumulate for months.

Hospitals differ widely in their cleanliness and the general state of tidiness is a yard-stick of the efficiency of the administration and the seriousness with which attempts are made to control infection.

Dirt and dust contain micro-organisms which can become airborne and staphylococci can survive much longer in dust than on exposed surfaces of a ward. Not all the organisms in the dust are pathogenic and the majority of them can be removed from a floor by washing with soap and water or better still by cleaning with an effective disinfectant. These procedures, however, do not remove all the bacteria and they cause a more even distribution over the treated surfaces of the organisms which survive. Environmental disinfection is valuable in (1) removing droplets of sputum, pus and excreta which harbour and protect micro-organisms and (2) preventing organisms from accumulating on the apparatus used for cleaning the walls, floors and equipment.

6.4 The Catering Department.

The two handbooks issued by the Ministry of Food "Hygiene in Catering Establishments" (1951) and "Clean Catering" (1953) give

technical information which is invaluable for a C. O. I. Officer.

Laboratory tests are advisable for applicants before appointing to the catering staff (para 9.8).

6.5 The Laundry

The C. O. I. Officer has a responsibility to ensure that the collection and laundering of linen is arranged so that the nursing, portering and laundry staff do not become infected and that inanimate objects do not become contaminated. This usually necessitates the recognition and separation of three categories of linen i. e. soiled linen from uninfected individuals, fouled linen i. e. fouled with excreta and contaminated linen i. e. linen from infected patients. Disposable plastic bags should be provided for conveying the fouled and contaminated linen from the wards to the laundry. The C. O. I. Officer may suggest criteria for classifying the linen.

6.6 The Autoclaves.

A high vacuum autoclave is a complicated piece of machinery and for it to be efficient in sterilising packs and instruments, it must be installed, serviced, maintained, operated and tested. In the past these requirements were a source of anxiety to the hospital engineer and the C. O. I. Officer alike but now the makers of the autoclaves such as Drayton Castle Ltd., run three-day courses every month at their works for hospital engineers, fitters and



electricians. Where the Regional Hospital Board's specification includes works training in the purchase price they levy no charge. Otherwise they charge £6 or £15 for each engineer depending on whether he is provided with accommodation. The course is comprehensive and includes the principles of downward displacement and high vacuum sterilising, Bowie/Dick Test, practical demonstrations of the lay-out and components, stripping down, adjustment, locking mechanism fluid sterilisers, planned maintenance, (daily, weekly, monthly and three monthly), fault-finding and remedies.

The responsibility of the C. O. I. Officer consists of testing and he may use one or more of five methods:- records of autoclave cycles, killing of bacterial spores, Browne's Control tubes, ^{*}the *(Bowie et al., 1963)* Bowie/Dick Tape Test and Thermo-couples. Of these the spore tests may not reveal defects until five days have elapsed.

6.7 Central Sterile Supply Departments.

Future C. S. S. D. s will probably be organised on a Regional basis as at the Victoria Infirmary, Glasgow (Weymes, 1968) or to supply approximately 2,000 beds. The C. O. I. Officers in the hospitals supplied may therefore have no responsibility for their operation. Where they do have responsibility, it usually consists of inspection of the records of the autoclaves cycles and the Bowie/Dick Tests. A Sub committee of the Control of Infection Committee is useful in helping the Superintendent of the C. S. S. D.

* Albert Browne, Ltd., Chancery Street, Leicester.

to decide on the contents of the packs and other matters. (Para 10.6b).

Disposable sterile plastic syringes are now available at prices which make the establishment and operation of hospital sterile syringe services uneconomic.

7. TRAINING OF THE HOSPITAL STAFF FOR THE CONTROL OF INFECTION

7.1 The need for training. Most of the hospital staff are, to a greater or lesser extent, concerned with the control of infection. The medical, nursing, administrative, catering and domestic staff are those most intimately involved and each of these groups needs training at different levels to enable them to play their parts intelligently in the combined exercise for the control of infection.

7.2 The Bacteriologists. In all the hospitals visited, the bacteriologists have wide knowledge and experience of their subject. The examinations for the membership of the College of Pathologists are searching and possession of the diploma (M. C. Path.) is accepted as evidence of suitability (qua knowledge and experience) for appointment to a consultant post in bacteriology.

The application of bacteriological knowledge to the control of infection can only be learned by experience gained by working in a hospital. Even the most enlightened undergraduate syllabus as practised in Monash University (para. 7.6 and Appendix K) is neither intended, nor is adequate for training of a future Control of Infection Officer.

The syllabus for the course for the Academic Postgraduate Diploma in Bacteriology of the University of London held in the

London School of Hygiene and Tropical Medicine provides a wide training in theoretical and practical academic microbiology. The subject of the control of infection is, however, not dealt with even in the part of the syllabus entitled "Bacteriology and Immunology applied to Hygiene and Medicine" which is devoted to the practical application of immunisation, herd infection and herd immunity. The course includes a general study of antibiotics but as the school is not attached to a hospital, it cannot cover adequately the problems which arise from treating infected patients. (Fulton, 1968).

Similarly the course given in the University of Manchester for the postgraduate Diploma in Bacteriology does not include instruction for the control of infection in hospitals other than three weeks of the Michaelmas Term given over to sterilisation and chemotherapeutics. (Collard, 1968).

It is possible therefore that when the Public Health Laboratory Service takes over the bacteriology of hospital laboratories, the directors of the laboratories concerned may find themselves faced with problems for which they have had little or no experience. Their sound bacteriological training combined with common sense and tact should, however, enable them to overcome any such initial difficulties. Howie (1968), however, holds that the laboratory Director should not act as an amateur epidemiologist. The Medical Officer of Health should be available to give epidemiological advice (para. 3.4).

7.3 The Medical Staff other than the Bacteriologist.

All medical staff should have a basic, but not necessarily detailed, knowledge of bacteriology and its application to the control of infection. The standard of knowledge revealed in this investigation varies widely and where it is inadequate the effective control of infection is difficult.

7.4 Consultants. Criticisms by both doctors and nurses were frequent in this investigation. They were obviously genuinely believed to be justified and not mere calumnies inspired by personal antipathy. Their essential content was that some doctors make a mockery of the "no-touch" technique which has been accepted as a discipline for wards and theatres and in so doing expose the patients to unnecessary risks and give a bad example to their juniors and the nurses. This can be due only to inadequacy of knowledge or inadequacy of care. Even the most senior consultants, i. e. those due to retire at the age of 65 should have received adequate teaching because they would have been in their third or fourth undergraduate year about 1922 when the teaching of bacteriology (but not virology) was well established. Not every breach of discipline is invariably followed by infection (para. 4.16) and this may foster the erroneous belief that aseptic technique is a meaningless ritual and the bacteriologist a well-meaning nuisance out of touch with clinical realities (Howie, 1963).

The clinical consultant who shows little or no interest in infection presents a problem to the bacteriologist. Tact and infinite patience are essential. The necessary education can be put over surreptitiously by carefully prepared contributions to the clinico-pathological conferences and should an outbreak of infection occur, by sending the consultant concerned a clear written account of what went wrong and how a repetition may be avoided. Above all there must be no suspicion of criticism far less an indictment. Diplomatic relations must be maintained at all costs (para. 4.16).

7.5 Junior Medical Staff.

Some housemen on assuming their first (pre-registration) appointments show a profound ignorance of the principles of hygiene and the technique of surgical dressing. This stems from inadequate teaching at undergraduate level.

Most of the medical schools undoubtedly provide excellent courses but one, at least up to two years ago, gave one intake of students in each year no training at all in bacteriology. The only instruction in bacteriology which these students received was therefore one hour's informal talk and demonstration each week for the thirteen weeks of their attachment to the district hospital linked with the medical school. Even if this defect in the curriculum is corrected forthwith, some individuals with little or

no knowledge of bacteriology may hold hospital appointments for the next forty years and they may treat the efforts of a Control of Infection Officer trying to convey his ideas with anything from amused tolerance to active and truculent opposition.

7.6 Undergraduate teaching.

The remedy for these defects (para 7.5) is to bring all undergraduate teaching in bacteriology up to the level of the best medical schools. The curriculum is already too full and an intensive and detailed course in microbiology is neither required nor suitable for students who are not destined to make microbiology their life work. Nevertheless, sufficient information should be put before all students so that they can appreciate the potential dangers to which their patients will later be exposed and know how to protect both their patients and others from these dangers.

A practical way of rousing interest in bacteriology among students is informal talks and demonstrations to small numbers. The attendance should be optional. The talks should be enlivened by personal anecdotes and the classical systematic consideration of the different organisms in sequence could well be replaced by one in which discussion of one group of organisms should include only the bare essentials to enable the student to understand how the organism is examined and the implications of the report. This is followed by

the pathology of the lesions caused - the medical and surgical lesions, their treatment and the prevention of their spread by using methods such as phage-typing. The talks should be reinforced by short practical classes.

The curriculum at Monash (Appendix K). In this new university, nine young professors were appointed between 1962 and 1965 and, untrammelled by tradition, vested interests or older colleagues, produced a curriculum which should inculcate an appreciation of the importance of, if not a liking for, microbiology. The continuing education through the three clinical years is assured by setting essays, holding class examinations, laboratory clerking, attendance at the I. D. hospital and an integrated final undergraduate examination (Clark et al, 1967).

The full effect of this enlightened curriculum will not be felt for the best part of a generation and it must not be dissipated by bad example and laissez-faire attitudes of senior members of the staff when the students become housemen.

7.7 Continuing education as enunciated in the Todd Report is as important in systematic and applied bacteriology as in all the other subjects of the curriculum.

On assuming their appointments, housemen are usually plunged straightaway into the routine of their firms. Some, part-

icularly those from the Commonwealth, think that they do not require further training and feel that they might lose face if they admitted ignorance of anything they should be expected to know. They therefore may resist attempts on the part of their seniors to teach them.

Several Matrons and Infection Control Sisters suggested that on taking up their appointments all housemen should have several meetings with the C. O. I. Officer or I. C. S. to learn or revise their knowledge of infection control and surgical dressing techniques. The real reason for this arrangement might be tactfully disguised as an opportunity to acquaint the newcomers with the practices peculiar to the particular hospital. One Matron suggested that new housemen should be excused routine duties for the first four days of their appointments so as to give those willing to learn a chance to do so but this would be difficult in hospitals where the house appointments are synchronised.

The bacteriologist should help the junior members of the clinical firms by discussing with them the problems of infection as they arise and conversely the housemen and registrars should absorb as much information as they can from these discussions on individual patients in the wards and the weekly clinico-pathological conferences and medical meetings.

Keen young graduates may opt to do a house appointment in pathology and this is usually to their lasting benefit irrespective of what appointment they ultimately fill.

7.8 The Training of the Nursing Staff.

By their close contact with patients, nurses are in a key position to cause or prevent cross-infection.

In the present investigation there were practically no complaints against the nursing staff.

Training. Thirty and more years ago, nurses' training meant 'four years hard manual labour interspersed with a few hours rest or sometimes deep sleep, during lectures' (Allen, 1963). These nurses emerged with sound practical nursing experience and are now the administrators of today. They have had to rid themselves of unquestioned tradition, keep their ideas up to date and avoid undermining the knowledge taught to the present generation of student nurses. Most of the matrons now in post are receptive to new ideas and are able and willing to guide their sister-tutors, ward-sisters and theatre sisters on the revision of old methods and the introduction of new ones. They are all playing their part in the control of infection with intelligence and hard work, but there is no reason why the principle of continuing education prescribed for doctors should not also be available for nurses.

7.9 The General Nursing Councils.

There are three different General Nursing Councils, one for England and Wales, one for Scotland and a joint one with midwives, for Northern Ireland. Each of these Councils produces its own syllabus and each syllabus provides for training in the prevention of infection. A bacteriologist usually gives lectures to reinforce the tuition given by the sister-tutor and gives practical demonstrations on the presence of micro-organisms on the hair, hands, mouth and dust. The Scottish Council attaches special importance to the control of infection (Appendix L) and the subject also appears in their "syllabus of instruction in community health and social service approved by the Society of Medical Officers of Health and the General Nursing Council for Scotland for student nurses undertaking three weeks in the health department of a local authority during training for admission to the general part of the register of nurses". The same council have been reviewing their syllabus of training for all parts of the Register and they believe that the time devoted to Community care and Rehabilitation should be increased from 3 to 12 weeks.

7.10 Films and Diagrams for Teaching.

The lectures and demonstrations on microbiology and the control of infection can be reinforced by films, the cost being met out of

Exchequer Funds allocated to Area Nurse Training Committees.

This scheme was reviewed by the Division of Hospital Facilities (King's Fund, 1961). Diagrams, too, are excellent for impressing the nurse with the right methods and are in a form which is readily remembered. (Hare, 1961.)

7.11 Standardisation of nursing techniques.

A student nurse is confused when she sees a sister or staff-nurse use a technique different from the one she was taught. The Wessex Regional Hospital Board therefore issued an illustrated pocket-book (5" x 3½") describing the standard techniques used in the wards and departments supplied by the Portsmouth and Poole Central Sterile Supply Department. This facilitates the transfer of nurses between different hospitals in the region and the Nursing Liaison Officer of the C. S. S. D. in each hospital demonstrates the techniques to newly appointed staff-nurses who have been trained outside the region.

7.12 Training of the future Infection Control Sister.

The General Nursing Council for Scotland emphasise that a general should precede a specialised education and that the student entering nursing cannot properly identify the trend of his or her interests and abilities until exposure to the various aspects of nursing has taken place. The specialised knowledge required by an I. C. S., as by a C. O. I. Officer, can only be learned by experience. One

I. C. S. voluntarily attended evening classes in bacteriology designed for student laboratory technicians so as to familiarise herself with bacteriological methods.

7.13 University Courses for Nurses.

The Department for Nursing Studies in the University of Edinburgh was established in 1956 by agreement between the University, the Department of Health for Scotland, the General Nursing Council for Scotland and the Scottish Board of the Royal College of Nursing. An International School for Advanced Nursing Education was also established in 1964 in collaboration with the World Health Organisation. The Department provides courses for those who wish to combine nursing practice with an academic education on leaving school, qualified nurses who wish to prepare for teaching or administration and those with post-basic education who wish to prepare for administration such as nursing advisers at local, regional or national level.

A student can therefore study for the Degree of Bachelor of Science (Social Science - nursing), the degree of Master of Arts with Nursing Studies or one of four different certificates in Nursing Studies. The different certificates cater for different needs - (1) for Nurse Tutors, (2) for administration, (3) general certificate and (4) administration - International School.

The Princess Alexandra School of Nursing at the London Hospital has started an associated course in nursing and a Bachelor of Science (Economics) at the University of London (Queen Mary College). The course lasts 4 years 5 months and is designed "to provide a broad preparation which should enable the nurse to make a valuable contribution to the community, to the National Health Service, to the nursing profession and to society and to provide shorter avenues of promotion for the nurse with outstanding qualities of leadership in either nursing research, administration or teaching". ~~Some~~ Some of the Canadian Universities, ^{e.g.} McGill University also offers courses leading to degrees of (1) Bachelor of Nursing, (2) Bachelor of Science in Nursing and (3) Master of Science (applied).

Although some of these courses include instruction in bacteriology, they are not designed particularly for the control of infection but will ensure that the senior members of the nursing profession will be equipped to be adaptable for any changes with which they may be faced whether they are in administration or research.

7.14 The lay administrators.

In the hospitals where there were no Medical Superintendents, criticism of the lay administrators by both doctors and sisters was frequent. It was alleged that they neither knew nor were interested

in what was required of them for the control of infection. They had no appreciation, it was alleged, of the need for urgent action as when the high-vacuum autoclave of the C. S. S. D. or the refrigeration in the children's milk-kitchen needed repair. A Supplies Officer might act on the advice of the Group Engineer and order a high-vacuum autoclave without adequate consultation with the bacteriologist or he might order without discussion a cheaper article than one specified in a requisition.

Analysis of these complaints suggest that they were due to one or both of two causes:-

(1) The far too frequent failure of communications leads to bad relations degenerating into lack of cooperation and sometimes wilful obstruction. There is then rarely one individual completely blameworthy and one completely blameless. The ability to work amicably with someone one does not particularly like can be acquired and is an essential quality of a successful administrator.

(2) In the absence of a medical superintendent some C. O. I. Officers turn to the lay administrator and unreasonably expect him to appreciate and give decisions on medical matters. This is a reflection on the inadequacy of the medical administration (para 3.6).

The undoubted efficiency of the senior lay administrator is due to his training and experience. Unfortunately many of the

medical staff fail to appreciate his difficulties. No matter how efficient he may be, he is not in a position to judge medical issues expertly and the consultants may on that account become suspicious of him. He loses their confidence and this is often repeated throughout the lower levels of the administration. If the doctors do not ask him to attend their medical staff meetings and possibly act as their secretary they lose one of the most useful sources of help and information. The Group Secretary can keep the minutes but more important, he knows the content of the Ministry circulars and so can guide the consultants to make a decision on which he can take action. The longer the doctors keep their Group Secretary at arm's length and out of their mess, the greater becomes the antagonism between them and even if they do eventually bring him into their confidence, relations are never as happy as if they had accepted him from the first.

Training of the lay administrators.

In England and Wales candidates are selected by the Regional and National Staff committees for entering one of the three institutions for training as future hospital administrators. The institutions are (1) the Hospital Administrative Staff College of the King's Fund (soon to be merged with the other three colleges of the Fund into The King's Fund College of Hospital Management), (2) The Nuffield Centre for Hospital and Health Service Studies at

Albert Mansbridge College in Leeds and (3) The Department of Social Administration in the University of Manchester. In the first of these institutions the trainees have one formal lecture from an expert bacteriologist and are assigned periods of attachment to different hospital units whereby they gain an insight into the control of infection, C. S. S. D., barrier-nursing and hygiene in relation to catering (Reeves, 1968). In Leeds the trainee administrators receive five lectures on the control of infection as well as seeing the work in C. S. S. D. s laboratories, sterilisers and attending a Control of Infection Committee (Schwarz, 1968). In Manchester the trainees learn about the control of infection during their hospital attachment in which they visit theatres, wards, pharmacy, pathology department and C. S. S. D. (Millard, 1968).

These institutions are faced with the difficulty presented by the plethora of subjects suitable for presenting to their students and the need to select those deserving of the greatest priority. When it is remembered that the future lay-administrator should not be required to give advice on the medical but only the lay aspects of the subject, the syllabi of these institutions appear to be well-balanced although many a C. O. I. Officer might want more emphasis to be laid on his subject and this could only be done at the expense of the other subjects in the course. There is a possible danger that were the training to be too detailed, the future administrator

might be tempted to give decisions in medical matters.

The Hospital Administrative Staff College is fully aware of these difficulties. It has experimented to try to assess how much of medicine and the basic sciences a hospital administrator needs to know. The aim is "to assist the trainees in their understanding of the medical profession and its task; and provide them with enough information about hospital patients and their needs to help establish priorities in management". (King's Fund Annual Report, 1967).

7.15 The Training of the Medical Administrator.

In this investigation there was no criticism of the lay administrators in Scotland because the administrative part of the control of infection is carried out by the Medical Superintendent. The medical staff discuss with him the medical problems which arise. He can understand the implications of their needs and give appropriate decisions. It is much easier for him than for a lay administrator to gain the confidence of the consultants and have his judgement respected by them. His training is discussed in paras 3.6 and 3.9.

The Scottish Hospital Administrative Staffs Committee in Edinburgh runs nine different courses adapted to the needs of different grades of administrators as well as management seminars for senior administrative staff including doctors and nurses. Some of the courses are held in Edinburgh and others at Chesters, Bearsden, the residential centre of the Department of Industrial

Administration, University of Strathclyde.

7.16 Training of the Catering, domestic, laundry and portering staffs.

In addition to instructions given to these staff by the heads of their own departments, elementary tuition can help them to understand why hygienic precautions are necessary. If this is done by lecturers, the lectures should be simple and short (say 20 to 30 minutes). They may be given by the Bacteriologist or he may invite the local Medical Officer of Health to give them (Min. of Health Memo RHB(53)53). The Manual of Army Hygiene shows how the subject can be expounded in the simplest manner. The lectures should be repeated frequently and can be re-inforced by films (from the Central Film Library), film-strips (from the Central Council for Health Education), a booklet (from the St. John Ambulance Association) and booklets, leaflets and posters (from the Central Council for Health Education). (The same Memorandum, 1953).

These training schemes can be extremely successful in hospitals which retain their staffs for years. On the other hand, in industrial areas, local factories compete successfully for the labour available and the hospitals frequently have to employ the least reliable individuals who rarely stay in a job for more than a short time. The constant changes in the personnel and language difficulties may daunt the most intrepid lecturer.

8. THE DISSEMINATION OF INFORMATION

8.1 The Ministry's recommendations are given in the Report of the Cohen Committee. The Control of Infection Officer is responsible for seeing that infection registers are maintained (para 70), for scrutinising them (para 69), for collating the information recorded in them (para 70), for keeping the responsible members of the hospital staff informed of the incidence of sepsis (para 161) and for giving the information along with his advice to the Control of Infection Committee (para 161).

8.2 The different methods of dissemination.

The methods by which the C. O. I. Officers keep their colleagues informed vary widely. Some bacteriologists send to each hospital or ward from which they receive specimens, a weekly return of the infecting organisms which have been isolated from patients in the particular hospital or ward. Another used to send a list of every infection which could cause cross infection to every consultant, ward and department in the whole hospital. The infectious were arranged according to the wards so as to let each consultant know what infections were present in any particular ward at the time. The scheme was useful to the surgeons, who are frequently asked to operate on patients in medical wards but it had to be discontinued because of the amount of clerical work it

needed. Another C. O. I. Officer sends to every consultant a monthly return showing the proportion of infections in all the wards and (for comparison) the average for the whole hospital. Another, probably more tactful, sends to each consultant the figures for his wards only and the average for the whole hospital.

8.3 The simplest means of dissemination is probably for the C. O. I. Officer or Bacteriologist to give a short precis to each meeting of the Control of Infection Committee. The precis is then entered in the unconfirmed minutes which go to the next meeting of the Medical Committee (para 10.12) and are available to the Matron for transmission by her to the Sisters' meetings.

9. THE ADMINISTRATION OF THE CONTROL OF INFECTION OFFICE

9.1 Administration.

"Close links between the personal health services and certain aspects of public health work are essential to prevent and control communicable diseases. Responsibilities should be clear so that there is continuous and effective surveillance in the community of the incidence of communicable disease, and of the safety and cleanliness of food; and so that suspicious circumstances are promptly investigated, skilful and thorough assessments made, and firm measures taken to prevent, limit and control the spread of disease".

(The Green Paper (1968) paragraph 43).

" on the administrative side of any great organisation there are minds, among members and officers alike, which pay more heed to the correct procedural working of the administrative machine than to the results achieved. In this way the machine can quite easily become more important than the job it has been created to perform".

(H. M. C. Macaulay, 1954).

The simpler the administration, the less there is to go wrong. The fewer people that are involved, the sharper the

definition of responsibility and the less chance of evasion.

9.2 The objectives of administration are:-

(i) Assessment of the amount of hospital-acquired infection.

This necessitates the keeping of records (paras 5.1 to 5.7) and their surveillance (para 9.3).

(ii) Stimulation of the clinical staff to observe rituals based on sound bacteriological knowledge (paras 7.1 to 7.13).

Four principles of ward procedure were enunciated by Blowers (1961):-

(a) Patients who are especially liable to spread infection and those who are especially susceptible to it should not be accommodated in the same ward.

(b) The ward staff should not themselves be dangerous sources or vectors of pathogenic organisms.

(c) The patient's inanimate environment should not become a reservoir of pathogens

and (d) Ward techniques must be those least liable to convey pathogens.

(iii) Arrest of the progress of an outbreak of infection as early as possible (paras 9.3 to 9.5).

(iv) Preparation of a policy for the use of antibiotics (para 10.6)

(v) Monitoring of the cleanliness of the hospital (para 6.3), the catering department (para 6.4), the laundry (para 6.5), the autoclaves (para 6.6) and the health of the hospital staff (paras 9.6 to 9.9).

9.3 Recognition of cross-infection.

Whatever the administrative structure, the Bacteriologist, the Control of Infection Officer or their representative surveys every day a record of infections. As soon as he observes two or more isolations of the same organism (or the same phage-type or the same pyocine type) in any part of the hospital or is given "additional information" (para 4.14a) it is his responsibility to make an appreciation of the situation. He first tries to determine the source of the infection. He therefore tells the clinician concerned the known facts, discusses with him their significance and decides with him as to any action desirable. In Scotland the Medical Superintendent may take part in the discussion.

When such discussion is necessary, the Bacteriologist usually makes detailed notes of the facts elicited until he is satisfied that the incident is over.

9.4 Further bacteriological investigation may be necessary to identify the source of the infection. This may entail taking and examining specimens from patients, staff and the ward and its equipment. The isolation of an organism from one of the staff is not proof without epidemiological evidence that he is the cause of the outbreak. If an Infection Control Sister has been appointed she will help in the investigation (para 4.11).

In maternity units, pupil midwives circulate round the different sections and so a carrier among them can disperse her organisms widely. The regulation of the Central Midwives Board allowing them only three days sick-leave during their six-months course tempts them to hide infections such as a sore-throat.

9.5 Executive action may be required in the interests of both the infected and non-infected patients. The need may develop with little warning and may be urgent. A susceptible patient must be separated from the source of the infection. He may, therefore, be discharged to his own home, or placed in a single-room or the infected patient may be transferred to the local Infectious Diseases Hospital. If the ward is of the "Falkirk type" (Scottish Home and Health Department, 1966) isolation is easy but in an old hospital there may be no side ward and the infected patient may not be in a condition to be moved or he may require highly specialised nursing which may not be available at the Infectious Diseases hospital. Such conflicts between the welfare of infected patients and the protection of others in the ward may be incapable of satisfactory solution. If the infection is not contained the ward may have to be closed.

Sometimes the C. O. I. Officer must insist on action being taken. For instance, a house-surgeon with an infected hand must be sent off duty and not allowed to resume until bacteriological

tests show him to be free from infection. The C. O. I. Officer should try to secure the agreement of the senior surgeon and should explain his reasons to the houseman and he may have to meet criticism from other members of the staff by reminding them that criticism made without knowledge and responsibility is not well-founded.

Executive authority is rarely accorded to the C. O. I. Officer (para 11.2). Any authority he has is, therefore, at most sapiential and advisory. His success in securing action depends on his personality, tact, powers of persuasion and the reasonableness of his cause. His efforts may consume much of his time. The consultant he seeks may hold a part-time appointment and not be available or he may have neither knowledge, interest or belief in infection far less its control. He may need some convincing that staphylococci from a boil in one patient may cause a fatal pneumonia in another with a cor pulmonale (Gray et al, 1962).

Most consultants co-operate well with the C. O. I. Officer and he should not endanger this good relationship by requesting unnecessary irritating ritual or other examinations which have little prospect of being of practical value. One of the chief reasons for lack of co-operation is a laissez-faire attitude and failure to appreciate the seriousness of the possible consequences of failure to act.

Instances have occurred in which the required action was not taken because the consultant in charge of the patient went on leave without giving his Senior Registrar authority to act for him. This could be prevented by a standing arrangement whereby the Senior Registrar or another consultant automatically had authority to act for him in his absence.

If the C. O. I. Officer fails to secure his aim by direct discussions with the clinician concerned he will doubtless approach the Chairman of the Medical Committee but he may experience again similar difficulties. Theoretically he should perhaps call a meeting of the Control of Infection Committee but this does not hold out hope of an immediate solution of the problem.

When the Senior Administrative Medical Officer of the Regional Board allocates one of his assistant medical officers to a Group of hospitals in his region to foster better communications, he may be able to resolve such problems. His success depends on the S. A. M. O. concerned and in particular on his personality and ability to reconcile consultants with different attitudes, and his knowledge and experience of hygiene to decide what is really important.

The C. O. I. Officer should, on only the rarest occasions, have recourse to formal letters, complaints, prolonged discussions in committee or formal enquiries at Group, Board or higher

administrative levels. Even if he attains his objective by such means, he may find that the ill-feeling engendered may make his task more difficult in the future.

In Scottish hospitals the bacteriologist does not carry the onus for securing action. He makes his recommendations (for say isolation of the patient) to the consultant and discusses the situation with him. In the rare cases in which there is difficulty, he informs the Medical Superintendent who, in turn, may tell the Senior Administrative Medical Officer. The Medical Superintendent has executive powers but only on the rarest occasions has to use them.

Where there is a Control of Infection Committee the bacteriologist or C. O. I Officer advises them on the policies which he thinks should be introduced but in the absence of such a committee he submits his ideas directly to the Medical Committee (sometimes called the Medical Association).

9. 6 Health of the hospital staff.

Medical students and nurses should be tuberculin-tested in their training schools and non-reactors re-tested at 3-monthly intervals until conversion. They should not be allowed to work on tuberculosis wards for one year after conversion. All nurses should have a chest film before entry and thereafter at yearly intervals.

The undiagnosed patient with tuberculosis in a general ward is one of the chief sources of tuberculosis for nurses. When open tuberculosis is diagnosed in a patient in a general ward, he is, therefore, immediately transferred to a tuberculosis ward. (Ball et al., 1950). The bacteriologist, too, on finding tubercle bacilli in such a patient notifies not only the physician in charge of him but also the chest physician.

These measures should not be allowed to lapse in view of the large numbers of immigrant nurses in the National Health Service (Toussaint, 1969).

9.7 Protection of the Laboratory Staff.

The bacteriologist has a duty to ensure that his own staff are not accidentally infected. Good technicians realise the necessity for, and willingly accept reasonable discipline for handling infectious material (Public Health Laboratory Service and Central Pathology Committee 1958). The bacteriologist also includes in his lectures to student nurses instructions for sending specimens for examination without risk to themselves, the porters or the laboratory staff.

9.8 Immunisation of the hospital staff.

Maintaining the immunity state of the staff is a responsibility of the C. O. I. Officer, the Medical Superintendent or the physician in medical charge of the staff. They should agree

which of them actually carries out the tests (e. g. Mantoux test) and the inoculations (Ministry of Health, 1963). Vaccination against smallpox is specially important for out-patient and casualty staff and laundry workers. Mantoux testing and, when necessary, inoculation with B. C. G. vaccine should be routine for all medical students, nurses and laboratory staff (para 9. 6).

Routine x-rays are advisable for those specially risk and laboratory staff should be offered prophylactic immunisation against enteric.

The C. O. I. Officer or Medical Superintendent should keep records of the immunity state of the staff and should review them each year. Keeping such records may be difficult in hospitals with a rapid turnover of the domestic, catering and portering staff.

9. 9 Laboratory Investigation of special categories of hospital staff.

In addition to the routine medical examinations on all recruits to the staff, some categories should be examined to establish that they are free from infections which can be communicated to other individuals.

Pupil midwives may have nose and throat swabs taken on their arrival for the presence of staphylococci and hæmolytic streptococci.

Applicants for appointment to the catering staff should have their stools or rectal swabs examined for pathogens. In cities with large immigrant populations this can be particularly difficult. Some applicants never appear again after the swab is taken and other remain only a few days in the job. Some hospitals have therefore been forced to take a calculated risk and do away with these examinations altogether.

9.10 Deputy for the C. O. I. Officer.

There should be a deputy to act when the C. O. I. Officer is absent. The bacteriologist's senior registrar can usually act especially if he has had some years experience. In large hospitals there is usually another pathologist who has some knowledge of bacteriology but in small hospitals it may be difficult to find a suitable deputy.

10. THE CONTROL OF INFECTION COMMITTEE

10.1 The Ministry's recommendations are that

- (a) Hospital Management Committees and Boards of Governors should set up Control of Infection Committees (P. M. No. 1) (Appendix B)
 - (b) The C. O. I. Committee should include representatives of the medical, surgical, pathological and other staff, Matron, Casualty Sister, Sister Tutor and Medical Officer of Health (P. M. No. 1) (Appendix B) the Domestic Supervisor and Catering Officer (P. M. No. 1A) (Appendix B) the Hospital Secretary (Report of the Cohen Committee para 167) (Appendix F)
 - (c) the purpose of the C. O. I. Committee should be as given in P. M. No. 1 (Appendix B) and the Report of the Cohen Committee paras 41 & 168 (Appendix G)
- These may be summarised that the committee should, at regular and extraordinary meetings, review the sepsis record and advise on special

measures to be adopted in face of an outbreak.

10.2 The C.O.I. Committees in this investigation.

Some of the hospitals visited, especially in Scotland, have never appointed a C.O.I. Committee. Of the committees which have been set up, some are hospital while others are group committees. Most are subcommittees of a medical committee but some are appointed in their own right by the Hospital Management Committee or Board of Governors on the advice of the medical staff.

The size, constitution and meetings of the C.O.I. committee vary widely. An arrangement which suits one hospital does not necessarily suit another. One committee has 22 members and meets every quarter while, at the other extreme, another consists of three who meet daily but informally over the luncheon table.

Group committees tend to be larger than ones for individual hospitals because each of the constituent hospitals has to be represented. Such committees are often cumbrous and occupy many man-hours. Meetings called solely to comply with a decision that they should be held at frequent intervals are tedious for the members unless each agenda contains an item meriting discussion and decision.

The ideal arrangement is probably a small committee of

say six active members with power given to the Chairman to co-opt any member of the hospital staff when desirable. Some of the most effective committees are informal and meet only on the first sign of a possible outbreak. The C. O. I. Officer, as chairman, asks the appropriate colleague to ensure that the required measures are actually taken.

10.3 The Consultant in Infectious Diseases can be a very useful member of the Committee but the Domestic Supervisor and Catering Officer are usually not suitable for membership. If an item on the agenda concerns their work, they can be invited to attend the particular meeting.

10.4 Relations with the Medical Officer of Health of the local Sanitary Authority.

In spite of the Ministry's recommendation (para 10.1) the Medical Officer of Health is rarely a member of the C. O. I. Committee. This is unfortunate because such an appointment forms a useful and mutually advantageous link between the hospital and the local authority.

Clinicians have a statutory duty to notify certain infectious diseases to the M. O. H. but sometimes fail to do so. Anthrax should likewise be notified to the Chief Inspector of Factories and certain prescribed diseases (anthrax, glanders, leptospirosea,

ancylostomiasis, tuberculosis in certain individuals, farmer's lung and brucellosis) to the Ministry of Social Security.

When certain organisms (e. g. Salmonellas) are isolated, bacteriologists usually tell the M. O. H. They resent, however receiving at a later date a letter embodying their results without acknowledging the source and asking what action they have taken or intend to take. Such discourtesy is not intentional and could be avoided by a little forethought.

One bacteriologist invites the local medical officers of health and their Chief Inspectors to an annual conference to discuss problems of mutual interest and the attendances are good.

Since the virtual elimination of many of the infectious diseases (e. g. diphtheria, scarlet fever, whooping cough, poliomyelitis) the role of the Medical Officer of Health has been gradually changing from that of the guardian of the community against infections to devoting his time and energy to other aspects of public health work. He should, however, still continue his original function as epidemiologist for the area. Many outbreaks such as gastro-enteritis of children, are often present simultaneously in several hospitals as well as in the practices of the general practitioners. The Medical Officer of Health is frequently ignored and yet he is the one individual who can coordinate the activities of the clinicians, bacteriologists and general practitioners for the control of such an outbreak.

Some clinicians dislike their Medical Officer of Health possibly because they fear that he may interfere with their clinical freedom. They treat him as an outsider and he reacts by regarding them as usurpers of his function and criticising their activities. Only the consultants can reverse this deterioration of relations and can do so by keeping him informed of what is happening within their hospital, inviting his advice and help and, if there is a C. O. I. Committee, asking him to be a member.

10.5 The Group or Hospital Secretary and the C. O. I. Committee.

For the more formally-constituted committees the secretary should make an effort to attend the meetings in person instead of sending a junior member of his staff as his deputy. By doing so he can keep himself familiar with some of the difficulties of the medical and nursing staff and at the same time tell them how the different departments under his aegis can be used to help and how best to present a project for consideration by the Hospital Management Committee or the Board of Governors.

Better results can often be achieved and much time saved by preliminary informal discussion among a small number of the people most intimately concerned than by debate in a large committee. They can prepare a protocol for circulation to the committee before the meeting so as to give them time to consider

the idea. Sometimes an informal discussion with a member of the management committee or board will reveal how an idea is likely to be received and how any difficulties may be eliminated or eschewed without detriment to the plan as a whole. Indeed, the modification may be a considerable improvement on the original scheme. This procedure necessitates easy relationships.

10.6 The work of the C. O. I. Committee may be divided into two main parts.

(a) Review of the infection records and advice on special measures to be adopted in the face of an outbreak. The C. O. I. Officer submits to each meeting of the Committee a return of the infections which have occurred since the last meeting. Any review of this by the Committee is a formality because, by the time the records show a rise, an efficient C. O. I. Officer should have observed it and initiated measures to abort the outbreak. He therefore tells the committee what he has done in concert with the clinician concerned and the individual in charge of medical administration and he listens to any constructive suggestions the members may make.

Large committees are not suited for taking speedy day-to-day decisions for the control of an outbreak.

(b) Formulation and Review of the policy for the control of infection. The most useful function of the C. O. I. Committee,

where it exists, is the making and reviewing of policies on subjects such as the use of disposables, disinfectants and antibiotics, disinfection after infectious disease, cleaning procedures, laundry service, infections of the staff, general hygiene, the removal of soiled dressings, the visiting of patients and the teaching of the staff. It is quite usual for a subcommittee for the C. S. S. D. to be appointed. In some hospitals committees other than the C. O. I. one may deal with some of these items. A Drugs and Disinfectants Committee, for example may make suggestions for the use of antibiotics or disinfectants within the hospital and in hospitals with no C. O. I. Committees the Bacteriologist usually submits these subjects directly to the Medical Committee.

Some consultants may resent any suggestion as to which antibiotics they should prescribe. Care is therefore required in framing the recommendations and in particular reasons should be given for the suggestions made.

The C. O. I. Committee can also be used for defining responsibility for the supervision of the efficiency of sterilising of special equipment.

10.7 The C. O. I. Officer as adviser to the C. O. I. Committee.

Many of the items for the agenda of the C. O. I. Committee are put forward by the C. O. I. Officer who uses this method to promulgate new information as it comes to his notice or to try to correct in the

hospital any habit which may cause cross-infection. The Committee in turn looks to the C. O. I. Officer as their expert authority to guide them in their decisions and the usefulness of the Committee depends largely on his knowledge and enthusiasm.

C. O. I. Committees which have been in existence for years have probably formulated their policies and the need for their further meeting is thereby reduced. But the introduction of new methods, new ideas and new substances make it imperative that the Committee is ready and available to investigate them and advise on their suitability for use in their hospital.

The formulation of these policies has been made much easier by the experimental work done by individuals and teams in the Medical Research Council, the universities and medical schools and in the regional hospitals (Avery Jones, 1968a) There are, however, still many gaps in the existing knowledge and further research is needed.

10.8 Publications of research on the control of infections include "Sterilisation by steam under increased pressure" 3 reports (Medical Research Council, 1959-64); "The Diagnosis of Smallpox" (Ministry of Health and Scottish Home and Health Dept. 1963); "Control of outbreaks of smallpox" (Ministry of Health and Scottish Home and Health Dept. 1964); "The Provision of Topical Fluids for Surgical Operations" (Ministry of Health, 1966) and "Aseptic

methods in the operating suite" (Medical Research Council, 1959-64). In addition "Central Sterile Supply" (Nursing Times 1961), "Antibiotic and Chemotherapy" (Garrod and O'Grady, 1968), and "Planning a Surgical Supply Service" (Weymes, 1968) are helpful.

10.9 Promulgation of the results of research. Several Regional Boards and Hospitals have published booklets to help their staff on the technical measures for the control of infection. These include the South-Eastern Region (Scotland); The South West R. H. B. and United Bristol Hospitals and the Wessex R. H. B. Others (The Eastern Board (Scotland) and the Northern Ireland Hospitals Authority) have issued cyclostyled brochures and in the Central Middlesex Hospital the Medical Committee agreed on a simplification of the large number of disinfectants which had been previously used (Gray & Discombe, 1966).

10.10 Failure to apply the results of research is unfortunately common. For instance, the Working Party on Pressure Steam Sterilisers recommended in 1959 that sterile water for operating theatres should be prepared in bottles. Despite this tank sterilisers and piped systems were still being installed in 1964 (Kelsey and Beeby).

10.11 Indirect benefits of research in the form of good relations and co-operation at all levels of staff attend the production and application of these policies. An interest in the control of infection

is thereby stimulated. Clubs have been formed whereby workers on similar topics meet and discuss their methods and difficulties.

10.12 The findings of the C. O. I. Committee are usually sent to the medical committee in the form of a report or unconfirmed minutes. To obviate unnecessary delay the C. O. I. Committee should meet shortly before the medical Committee.

The findings of Group committees should be available to the medical committees of the constituent hospitals as well as to the Group Medical Committee.

The C. O. I. Committee is not an executive body. When their advice has been endorsed by the Medical Committee it should be translated into action by the Administrator or the C. O. I. Officer. When expenditure is involved, the recommendation has to be submitted to the Management Committee or Board of Governors.

10.13 The Chairman of the Control of Infection Committee.

The choice of the individual appointed depends on the people available. The C. O. I. Officer is usually appointed because he is the member most conversant with the problems. The Chairman must be really interested and willing to spend time on the work. As with all committees he should keep the meeting short without curbing discussion and he should rule that, except in special circumstances, all items on the agenda should be accompanied by

statements from their sponsors. He should attend the medical committee in person to speak on his own committee's report of minutes.

In a large hospital there is much competition among the consultants for priority in allocating the meagre sums available. While the Chairman of the C. O. I. Committee (or the C. O. I. Officer) should not indulge in ruthless lobbying, he should prepare to present to his colleagues, both informally and in committee, reasoned arguments for a share of the allocation. He can legitimately stress that his request is for the benefit and safety of the great majority of the patients and not for his department alone. He may also prepare a scheme as a special project for consideration by the Hospital Management Committee and Regional Board for Boards tend to help those hospitals which show serious efforts to effect improvements.

11. THE AUTHORITY OF THE CONTROL OF
INFECTION OFFICER IN ENGLAND AND
WALES AND NORTHERN IRELAND AND
OF THE MEDICAL SUPERINTENDENT
IN SCOTLAND.

11.1 The Ministry's recommendations were given in Memorandum R. H. B. (51) 100 and in para 69 of the Report of the Cohen Committee (Appendix M)). They are that the Control of Infection Officer should have executive function delegated to him by the Control of Infection Committee.

11.2 The authority of the Control of Infection Officer in different hospitals.

(a) In practice executive function as recommended by the Ministry is hardly ever accorded to the C. O. I. Officer in an unfettered form. The nearest approach was in one large ex-municipal hospital where he was granted the authority "in collaboration with the Medical Director or Chairman of the Hospital Management Committee". Discussions with consultants with considerable experience in administration show that members of medical (and C. O. I.) Committees are usually unanimously opposed to giving anyone of their number, authority which he could use to tell them what to do. Indeed it was suggested that were some such power to be granted to the C. O. I. Officer, the very possession of it might potentiate deliberate obstruction by his colleagues.

(b) There was, however, one notable exception to this general reluctance to depute executive function. One medical committee at first refused but after an outbreak of infection with two deaths and the closure of the wards concerned, they did a volte-face and agreed. The result is that their C. O. I. Officer proposed a standing arrangement which they have accepted whereby every patient transferred from another hospital is accommodated in a six room and barrier-nursed until the bacteriologist is satisfied, as far as is possible, that he is free from pathogens.

11.3 The authority of the Medical Superintendent in Scottish hospitals. In Scotland there is rarely a C. O. I. Officer (para 3. 9). Instead, the bacteriologist keeps records of his results and maintains a surveillance over them while the Medical Superintendent holds executive function not only for the control of infection but for all the other items of medical administration. The medical staff do not appear to resent his holding such power but rather seem to be glad to be relieved of the administrative aspect of their work which is not usually the part most congenial to them.

The authority exercised by the Medical Superintendent over the activities of his hospital (Appendix D) is, of course, far wider than is necessary or would be accepted as reasonable for a C. O. I. Officer. Nevertheless some of the powers of the Medical Superintendent would, on occasion, be most useful to a C. O. I. Officer.

For instance:

- (a) The Medical Superintendent has power to regulate admissions and he can use it to prevent children being admitted for an examination which can equally well be carried out at home (Paul, 1964). In this way he can obviate cross infection which can rise as high as 7.1% in children's wards with some children experiencing two and even three cross-infections (Watkins & Lewis-Fanning, 1949).
- (b) Likewise, the Medical Superintendent can discharge and transfer patients and this makes him much more effective than the C.O.I. Officer in isolating infectious individuals.
- (c) The Medical Superintendent, too, by virtue of his responsibility for the general supervision of the health of the staff can send infectious staff off duty and ensure as far as possible, that they are free from infection before they return to duty. Failure to take these precautions can have disastrous results. (Gray, 1956; Gray et al, 1962). and
- (d) The Medical Superintendent has authority over the junior medical staff and therefore can deal more effectively than a C.O.I officer with a houseman who persists in disregarding the rules of hygiene.

11.4 Comparison of the relative general advantages of the tri-partite system of administration and that in the charge of a Medical Superintendent is outwith the terms of reference for this project. The investigation, however, showed beyond peradventure, that for the control of infection, the presence of a Medical Superintendent is invaluable. He has medical knowledge and sufficient knowledge of hygiene to appreciate the importance of the facts brought to his notice by the bacteriologist; he can call conferences with consultants in charge of infectious patients and with any relevant member of the hospital staff; he has executive authority to take such action as he, his bacteriologist and the clinicians regard as necessary and by virtue of his appointment on the staff of the Regional Board his contact with the Senior Administrative Medical Officer is close. In contrast, the Chairman of the Medical Committee though, an excellent consultant, both liked and trusted by his colleagues will not necessarily have either the administrative experience or the knowledge of hygiene and social medicine to enable him to assess the importance of the early stages of an outbreak of infection. Further the amount of his executive authority is ill-defined and he therefore usually consults the Senior Administrative Medical Officer in any difficulty. If he holds a part-time appointment with sessions at another hospital, he may have difficulty in finding time for conferences. His relations with the Senior Administrative

Medical Officer will not likely be so close as those of a Medical Superintendent who is on his staff. The administration of a Medical Superintendent is therefore better adapted for quick action which is in the interests of the patients and, which is of lesser import, makes the life of the bacteriologist infinitely easier because he always has available in the Medical Superintendent an individual with knowledge and experience in preventive medicine coupled with executive authority.

12. THE FUTURE

12.1 The continuing need for the Control of Infection.

Machinery to control infection is essential for a modern hospital. There is every indication that this need will increase rather than decrease.

12.2 Ecological changes among microorganisms.

Microorganisms are constantly undergoing changes so that the measures for their control must be subject to continual review. Some ten years ago, staphylococci, especially those of phage type 80/81 behaved as "hyena" organisms causing serious and wide-spread epidemics but latterly, for reasons unknown, they no longer do so. With the use of sulphonamides and penicillin for treating staphylococcal infections, the gram-negative bacilli have caused an ever-increasing number of infections and since broad-spectrum antibiotics have been used, Proteus and Pseudomonas have come to cause more infections than Bact. Coli. Within the last few years methicillin-resistant staphylococci have made their appearance and their resistance extends to most other antibiotics except vancomycin. They are formidable pathogens for old and debilitated patients who are the ones most prone to hospital infection. Their presence in some hospitals where methicillin has never been used is puzzling and throws doubt on the principles on which existing antibiotic policies have been based. The subject needs further investigation

and may, indeed, lead to modifications of the present policy for the use of antibiotics.

12.3 Increase in population.

A forecast has been made that within the life-time of a child born today, the population will have increased nearly five-fold. (Report on Lord Ritchie-Calder's address to the Conservation Society. Times, 25th November, 1968). Barring nuclear holocausts and pandemics, the United Kingdom and Northern Ireland may be expected to share in this increase in the population. There will also be a rise in the proportion of aged people.

It would be prudent to make provision for these expected changes in the way of food-production, housing and hospitals. The hospitals of today are already inadequate for present needs. Without radical upgrading they will be still more inadequate for the future. Their overcrowding presents one of the major difficulties in the control of infection. Greater overcrowding will intensify it.

12.4 Changes in the pattern of illness.

Both the pattern of illness to which the individual is subject and the epidemics to which the community is exposed will continue to change as they have in the past.

12.5 Changes in diagnosis and treatments.

Dramatic changes in medical diagnosis and treatment have taken place in the last twenty years. It can confidently be

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expected that this trend will continue. Knowledge which is specialised to medicine and scientific knowledge which can be applied to medicine will continue to grow. Both the pattern of patient care and the structure for the prevention of diseases must therefore be continuously adapted to make full use of these advances in knowledge.

12.6 Research.

Many valuable investigations have been made in the past by the Medical Research Council, the Public Health Laboratory Service, academic departments and regional hospital boards. Some of them have been specifically directed towards the control of infection and others have a less obvious influence. These include the design of modern hospitals and especially of surgical theatres and wards; modern methods of sterilisation (high vacuum autoclave, radiation, chemicals, etc.), the introduction of central sterile supply; new antibiotics and so on.

Similar investigations are being made such as those by Dr. Lowbury and his staff at the Hospital Infection Research Laboratory at Sommerfield Hospital, Birmingham and by Professors R. E. O. Williams and R. A. Shooter and Dr. M. P. Jevons in London. In modern surveys an enormous number of observations are made, recorded and fed into a computer. Examples are the personnel on the ward, the frequency and methods of cleaning of the floors, walls, toilet equipment, blankets, curtains, screens, bedding, thermometers,

equipment, wound dressing techniques, use of rooms, facilities for isolation, treatment of ward equipment, antibiotics, disinfectants. Analysis of the results will undoubtedly yield pertinent information and point the way to changes in ward practice and techniques.

When money is so short, expenditure must be devoted for real needs and not squandered on measures of little or no value. Further research is therefore needed to avoid waste of money. There is no evidence, for instance, that increasing the spaces between beds from 6 to 8 ft. reduces cross-infection and the difference in cost is very great. Similarly, attempts to reduce the rate of post-operative infection may be costly out of proportion to the possible benefits. Half of a post-operative rate of 5% may be due to organisms which the patients were carrying at the time of their operations. Attempts to eliminate the remaining half may be inordinately costly and result in a reduction of only 1%.

The King's Fund has taken an increasingly leading part in implementing and evaluating the result of such research. Admittedly time and effort have been wasted by the duplication of work of project-teams particularly in the planning and design of new hospitals. Here again The Hospital Centre is planning to establish a regional information service and produce a handbook collecting and collating the information obtained. It also holds conferences at which different types of staff working in the same type of unit

pool their information and help each other to overcome difficulties common to them. These meetings have been valuable to observers from the Department of Health and Social Security and the Scottish Home and Health Department.

12.7 Conditions militating against the Control of Infection.

If the control of infection is to be taken seriously every loophole by which organisms are known to pass from individual to individual should be closed. Yet many of the hospitals and operating theatres and much of the equipment in use today facilitate such transfers. Hospitals built 60 or more years ago without adequate facilities for washing, conservancy or isolation are still in use. When they were planned, the existence, far less the importance of cross-infection was not recognised. They have large wards each containing up to thirty beds in one room and many of them have no single room or cubicle. In such circumstances the prevention of cross-infection is well-nigh impossible. By using bed-isolation and barrier-nursing, both of which are recognised as fallible, the doctors and nurses make the best of a bad job and can usually limit the outbreaks but only by improvisations and the expenditure of much unnecessary work and anxiety on their part. Operating theatres without filtered air under positive pressure and opening directly off corridors bearing heavy traffic have been proved to contain pathogenic spores. Yet operations are performed in them every day.

So-called "sterilisers" which are designed to boil at atmospheric pressure are known to allow organisms to survive. Yet they are still used for want of money to establish and run C. S. S. D. s .

As long as such buildings, theatres and equipment are used, so long will much preventible cross-infections occur. Doctors, nurses and administrators are being set a task which is made unnecessarily difficult for want of these obviously needed improvements and the unnecessary infections occur and will continue to occur at the cost of lives, disablement and suffering of patients and of legal damages against hospital authorities. And after these disasters, formal enquiries will emphasise yet again some variation in the ways in which the well established methods for the control of infection have been contravened. Further, with the continuing rise in the standards of living, education and public knowledge, people will be less tolerant of the results of cross infection than they are now.

Most hospitals today have available the service of a C. S. S. D. and a supply of sterile syringes either processed in a group sterile syringe service or obtained commercially as disposable plastic syringes. Few of them, however, have money available for new schemes but a very few have been fortunate enough to receive grants for special projects.

12.8 The ever-increasing risk of infection.

Modern methods of treatment increase the chances of

infection. Severely burned casualties are now resuscitated and so they survive to undergo a prolonged illness in which infections of their burns are inevitable. Similarly renal dialysis and transplant surgery in themselves increase the possibilities of infection and the unavoidable use of immuno-suppressive drugs in transplant surgery still further increases these possibilities. Recent advances in the treatment of malignant disease too, have lengthened the survival of patients with inoperable cancer. Many malignant conditions in themselves lower resistance to infection and radiotherapy, cytotoxic drugs, corticosteroids and broad-spectrum antibiotics enhance this effect. These patients may become infected by a wide variety of organisms - bacteria, viruses, protozoa and fungi and the majority of their infections are not recognised during life but are diagnosed only after death. Some of them succumb to "opportunistic infections" by organisms not ordinarily regarded as pathogenic. Drug addicts are widely susceptible to infection.

12.9 Future changes in the hospitals and the provision of Health Centres.

If the tentative suggestions outlined in the Green Paper are implemented the three branches of the present Health Service will be fully integrated. New "Area Boards" will replace and take over the functions of the Executive Councils, the Regional Hospital Boards, and the Hospital Management Committees and they will assume some

of the functions of the present Local Authorities. It is hoped that this single tier of administration for all hospitals will end the existing division of administrative responsibility for major planning on the one hand and the day to day control on the other.

Each district hospital will probably serve a community of approximately a quarter of a million people and more of its district is densely populated. Both ambulant therapy and out-patient monitoring will be used to the full extent to reduce the occupancy of beds.

The changes in general practice foreshadowed by Lord Todd in his address to the annual clinical meeting of the British Medical Association in October 1968 will undoubtedly affect the hospitals. The satisfactory operation of general practice is no longer possible for a single-handed practitioner or even for a small partnership for the essential proper equipment and assistance can be attained only by practitioners in large groups based on fully equipped health centres or clinics with adequate ancillary staff. This will not only better the lot of the G.P. but will allow of the integration of his work with the district hospitals to their mutual benefit. In particular, by easing the load on the hospitals both these changes will ease the control of infection in them.

12.10 The Control of Infection Officer of the future will almost certainly differ considerably from his predecessor of the present

era. Although the principles underlying his work will remain unaltered the form of the work he will undertake will change radically if he is the microbiologist and these requirements will necessitate modifications of the training he will have to undergo.

The equipment he will require will be modern, sophisticated and expensive and will include electronic apparatus and computers. This will affect both the site and design of all new laboratories and improvisation of the existing ones. The new methods will be more complex and will produce results more quickly than at present. The microbiological section of the Pathology Departments will be affected by these changes though to a lesser extent than the Bio-chemical section. For the sake of economy, specimens which do not require to be examined urgently will be centralised at a regional or national laboratory which will probably be distant from the hospital. There they will be subjected to bulk examination. Meanwhile the local expensive laboratory will be reserved exclusively for specimens which must be examined urgently either for clinical reasons or because they will deteriorate with keeping. Thus typing of microorganisms may be done at a regional centre and some of the routine serological tests may be sent to an automated blood transfusion laboratory instead of to the microbiological one. These arrangements will cause a great reduction in the number and variety of the examinations at the hospital. Technicians will not

obtain the wide experience which they reasonably want and need in preparation for their professional examinations and this may well aggravate their shortage. The mechanisation of much of the work in the laboratory will tend to make the technician into a mechanic operating a machine and pathologist into a mechanically-minded manager of the factory who has to maintain a close contact with industry. The new order will bring new dangers. A mistake will be more difficult to identify and may have disastrous consequences by invalidating a whole series of investigations instead of affecting one specimen only. The pathologist in his preoccupation with his "factory" may become decreasingly interested in, and available for, consultation at the bed-side and he may lose his expertise in techniques which are no longer done under his immediate supervision. It will be more difficult for a clinician on visiting the laboratory to trace the results developing for his patient in which he has a special interest and he will have to wait until the results on a whole series of specimens are completed. In the past, too, much valuable original work has been done in regional hospitals and this may be seriously interfered with in the future by the wide separation of different methods of examination.

12.11 The Future Training of Hospital Staff.

Training of the different categories of hospital staff at different levels is crucial to the future of hospital management and

it is not certain that the present structure of hospital management will be appropriate to the future when the three branches of the present Health Service are integrated. (King's Fund Annual Report, 1967). Administrators of high calibre will be needed. They will require a wide knowledge, experience and training in public health and general practice. This need is becoming increasingly recognised. The one-week management appreciation course run by the King's Fund for consultants was oversubscribed. The reports on the organisation of medical work in hospital from the Ministry (now Department of Health and Social Security) and the Scottish Home and Health Department show that at least the more percipient consultants recognise the need for more than clinical acumen. The Scottish Hospital Administrative Staff Committee too, have no misgivings in selecting three fellows each year for training as future administrators (para 3.7 (d)).

12.12 Policy for the future.

The changes in the hospitals and the provision of health centres (para 12.7) will influence the chances of infection. Many of the patients who now have to be admitted for investigation may attend in the future merely as out-patients and those who are admitted, will probably stay a shorter time in hospital than at present. They will therefore be less likely to become infected but against that the more daring operations and procedures will

increase their risks of infection.

These changes necessitate a well-thought-out policy on the priorities of medical care. The policy must be flexible and reviewed at frequent intervals so that it may be adapted to conditions which are changing constantly and sometimes imperceptibly.

If the control of infection is to be taken seriously it is imperative that new wards should be built in which the maximum number of patients in any one room will not exceed six and the number of single rooms will comprise at least 40% of the total accommodation and 50% in children's hospitals. Further, the single rooms if generous for one patient, should be designed so that they cannot accommodate two. Unless this is done an attempt will assuredly be made to do so as soon as the pressure on beds rises.

Similarly theatres with filtered positive pressure ventilation and adequately designed should be provided wherever operations are to be undertaken and both they and the wards must be supplied with packs from central sterile supply departments.

12.13 Financial implications

The administrative structure established for the control of infection is based essentially on the highly skilled techniques of the bacteriologist, nursing staff, engineers and pharmacist as well as the less skilled but no less essential work of the porters and domestic staff. It is the means whereby the skills of these different

people may be put to the practical benefit of the patients. This costs money. If money is not available the practical value of the machinery for the control of infection is reduced if not totally squandered.

The financial allocation for the Health Service is sufficient for only a fraction of the possible different projects. The arrangement of these projects in order of priority therefore merits the most careful consideration and a case can be made out for benefiting the greatest number of individuals rather than spending a high proportion of the money available in procedures which are of use to only the comparatively few individuals suitable for transplant surgery or renal dialysis. It is therefore incumbent on Regional Hospital Boards to provide realistic allocations for the control of infection. Money so spent is well spent so that infections which can be prevented are prevented. These include acute rheumatism with its sequelae of carditis and nephritis, death from staphylococcal pneumonia or enterocolitis, tetanus, loss of a limb through gas gangrene or a hernia made irreparable. The sums paid out formerly on legal damages could be applied to equipment.

It is generally accepted that new buildings and equipment are urgently needed for the control of infection. The likelihood of this being universally implemented in the near future is remote. In the meantime therefore it is necessary to ensure that the meagre

existing resources are used for the maximum benefit of the patient. The over-riding need for economy makes administrators, clinicians and pathologists alike cost-conscious but the present rigidity of annual budgeting makes this well-nigh impossible.

13. SUMMARY OF FINDINGS AND CONCLUSIONS

13.1 An enquiry was made into the administrative structure for the control of infection in British Hospitals.

13.2 The objective of creating a structure for the control of infection is to exclude, as far as possible, access of organisms at the hospital and to prevent their transfer to patients and staff.

The means of achieving this objective are:-

- (a) recognition of infection by means of records
(chapter 5) and their surveillance (para 9.3)
and action (e. g. isolation of patients or closure
of wards) (para 9.5).
- (b) stimulation of all staff to conform to orthodox
methods based on bacteriological principles
(chapter 7 and para 4.16).
- (c) monitoring of disinfecting processes and any
hospital activity which may affect the control of
infection (chapter 6).

13.3 Personal relations.

The most important single factor for the control of infection is state of the personal relations among the hospital staff.

When these are good, infection can be and is controlled whether the administrative structure is complex or nearly non-existent. When

they are poor no amount of administration will make the control of infection efficient (para 4.16).

13.4 The Cohen Committee made their recommendations specifically for the control of staphylococcal infections. Since then staphylococci have become much less troublesome than other (gram-negative) organisms. It follows that some of the recommendations of the Cohen Committee are not applicable for the present conditions.

Each hospital has its own particular problems (para 2.3) and personnel peculiar to itself. Each has therefore elaborated its own structure for the control of infection (para 3.2).

13.5 All hospitals have one individual to whom problems on infection are referred as they arise and from whom advice is sought on its control. He is nearly always the Bacteriologist because he has specialised knowledge and, by virtue of being in charge of the bacteriological examinations, continuing information on the state of infection within the hospital.

He may hold the additional appointment of Control of Infection Officer. He is nearly always a consultant.

13.6 In England and Wales and Northern Ireland the non-teaching hospitals or groups of hospitals have Control of Infection Officers and Control of Infection Committees.

In Scotland the hospitals have no special structure for the control of infection although a few have appointed their bacteriologists as Control of Infection Officers. Their bacteriologists and Medical Superintendents are responsible for the control of infection.

13.7 The duties of the Control of Infection Officer include:-

Responsibility for keeping and surveying records of infection which should include infections of the hospital staff (Chapter 5 and para 9.6).

Along with the appropriate clinician make an assessment of any potential outbreak of infection (Chapter 9) and give advice when required.

Inspection of autoclaves etc. (Chapter 6).

Teaching of hospital staff (Chapter 7).

Promulgation of information about infection (Chapter 8)

Maintaining records of immunisation of the staff (para 9.8)

Introducing new techniques via the Control of Infection Committee (paras 10.7 to 9).

13.8 Executive authority.

The C. O. I. Officer in England and Wales and Northern Ireland only rarely has executive authority (paras 11 1-2). The Medical Superintendent in Scottish hospitals is vested with executive authority for the whole of medical administration including the

control of infection (para 11.3).

13.9 A control of infection sister (I. C. S.) or nursing Officer (C. O. I. N. O.) is a useful but not essential member of the control of infection team. She can, on occasion, find out better than a clinician or bacteriologist the significant facts in an outbreak of infection and she can undertake duties which are rarely laid down as the responsibility of anyone else (paras 4.9 to 15).

13.10 C. O. I. Committee.

Some hospitals do not have C. O. I. Committees. Those which have been appointed vary widely in their size, composition, meetings and function (para 10.2).

C. O. I. Committees are not usually so effective for assessing and making decisions on a potential outbreak of infection as informal meetings between the bacteriologist and the clinician concerned. C. O. I. Committees are useful in formulating policies in relation to the control of infection and also for defining responsibilities for sterilising apparatus.

The findings of the committee are sent to the Medical Committee (para 10.12).

13.11 Defects in the present administrative structures for the control of infection arise from factors both external and intrinsic to the structure. They are not all found in any one hospital.

- (a) The continued use of obsolete hospitals and equipment and particularly the absence or inadequacy of facilities for the isolation of patients is both potentially dangerous to the patients and costly in the use of personnel, money and materials.
- (b) The training of some undergraduates in bacteriology especially in relation to clinical work and in surgical dressing technique is inadequate (para 7. 6)
- (c) The C. O. I. Officer's responsibility in the absence of executive authority (Chapter 11) makes his position anomalous but in practice this may not be important provided that his relations with his colleagues are good.
- (d) The records of infection (chapter 5) which are needed to give early warning of a potential outbreak can occupy a disproportionate amount of time of highly skilled staff. They are often unnecessarily detailed. Attempts to compile them on the wards or on information from the wards usually fail.
When records are dispersed throughout the

hospital their surveillance takes an unnecessarily long time.

- (e) As far as it affects the control of infection the medical administration of a hospital with no Medical Superintendent usually runs less smoothly than under a Medical Superintendent who has had training and experience in epidemiology and whose continuity of appointment is usually longer than that of a Chairman of the Medical Committee (paras 3. 6 and 11. 3 and 4).
- (f) In hospitals with no Medical Superintendent communications with the Regional Board may be tenuous for the control of infection. The secondment of a knowledgeable and active assistant senior administrative medical officer to a group of hospitals can often provide the help and advice required to prevent outbreaks of infection.
- (g) Too many doctors in the hospital service - both at Regional Board and hospital levels - tend to brush the control of infection aside as an unpleasant nuisance which is not worthy of their attention. They are not interested until they

come face to face with an outbreak. When they realise the actual and potential results of the outbreak they are glad to share their responsibility with a colleague who has knowledge and experience in the control of infection. Only then do they set up a panel with wide powers of inspection, reporting and advising and only then do they willingly give their C. O. I. Officer authority which they previously grudged and refused.

13.12 Assessment of efficiency of any structure for the control of infection is difficult because the absence of outbreaks of infection does not necessarily indicate efficiency.

In this investigation some structures appeared to be more successful than others. In them the members of the team know precisely their responsibilities, duties and authority and they could always depend on the co-operation of their colleagues.

13.13 The Microbiological services necessary for the control of infection are efficient.

13.14 In the future the need for the control of infection will continue (chapter 12). Changes are to be expected in the ecology of micro-organisms, the population, the pattern of illness and the

methods of diagnosis and treatment.

Research will be needed (para 12. 6)

The C. O. I. Officer of the future will differ markedly from his predecessor but the principles of his work will remain unaltered (para 12.10).

Administrators of high calibre will be needed (para 12.11).

Decisions will need to be taken on priorities, a policy agreed and realistic financial allocations made (paras 12.12 and 13).

14. RECOMMENDATIONS

14.1 The control of infection is made difficult in many hospitals because of the obsolete nature of the building and equipment. In spite of the improvements which have been made, much rebuilding is necessary. Unfortunately any general replacement or even, faute de mieux, renovation is unlikely in the present economic situation.

14.2 The control of infection is also sometimes made difficult by inadequacy of the bacteriological knowledge of some of the medical staff. Improved teaching of undergraduates where necessary should not involve additional expense and should be started forthwith. Even so, the effect of the deficiency will continue for years. Meanwhile bacteriologists should try to mitigate it as far as possible by teaching the medical staff.

14.3 There is need for a change in the climate of opinion regarding the control of hospital infection and for a greater awareness of the dangers of omitting to take steps to control it. Many clinicians behave as if public health measures, mass immunisation and the use of antibiotics had eliminated infections for good. Their ignorance leads to a sequence of indifference, branches of accepted procedures and finally panic when an outbreak threatens.

This chain of events should be reversed by:-

- (a) enlightened teaching of both undergraduate and postgraduates.
- (b) constant and exemplary behaviour by the senior staff and bacteriologists so that breaches of the accepted techniques are no longer regarded as amusing but reprehensible and anti-social.
- and (c) a memorandum outlining in the broadest terms recommendations for the control of infections in general and the different types in particular. To give it the best chance of being accepted and put into practice the principles should be simple, sensible and involve the minimum of effort. The memorandum should give the procedure for dealing with a potential outbreak (para 4.16) .

14.4 Detailed recommendation for an administrative structure to control infection may suit one hospital and not another. Guiding principles are therefore more practical.

The structure should be as simple as is consistent with efficiency and therefore economical in personnel and -money. This is achieved as follows :-

- (a) Full use should be made of the personnel available including the Medical Officer of

Health.

- (b) Work should not be duplicated (e.g. in the keeping of records).
- (c) Centralising records facilitates their surveillance.
- (d) Skilled and highly-paid staff (e.g. bacteriologists and sisters) should not be employed on unskilled work which can be done equally efficiently by less highly-paid staff.
- (e) Responsibilities of each individual concerned should be clearly defined for both him and his deputy. This is particularly important in hospitals with no Medical Superintendents.
- (f) Responsibility should not be allotted without adequate executive authority.
- (g) Every individual, including the clinicians, should know the procedure to be followed when cross-infection is recognised and how to obtain help if difficulties arise (paras 4.16 and 14.3c)
- (h) Promulgation of information on infections is most economically done through the Control of Infection Committee.

- (i) Unnecessary bacteriological investigations waste money and irritate clinicians. Apart from the requirements for diagnosis and treatment, bacteriological investigations should only be done to elicit information to prevent or arrest an outbreak of infection . (para 9.9)
- (j) An active C. O. I. Committee can propose policies on the use of antibiotics and disinfectants which can greatly reduce hospital expenditure.
- (k) Preventing cross-infection reduces the average stay in hospital, quickens the turnover and eliminates many legal actions.

The structure for the control of infection should also be flexible so as to :-

- (a) suit the needs of the particular hospital for which it is intended
- (b) use the talents of the available people to the best advantage
- and (c) be adaptable to the changes which are certain to arise.

14.5 The administrative structure for the control of infection rests primarily on one individual in each hospital or group of hospitals. There are strong arguments in favour of this being the

Bacteriologist. He should be of consultant status. Whether he receives the additional appointment of C. O. I. Officer matters less than that he should be responsible for keeping and surveying records of infections, investigating outbreaks, being available for discussion and giving advice on any required action.

The bacteriologist should have a deputy.

14.6 Personal relations are so fundamentally important for the control of infection that Appointments Advisory Committees should pay as much attention to a candidate's ability to work as one of a team as to his other qualifications. This is particularly important in appointing bacteriologists and control of infection officers (para 4.16).

14.7 When the bacteriologist (or C. O. I. Officer), after discussion with the clinician, recommends action such as the isolation of a patient or the closure of a ward, his responsibility should end there. Executive authority as recommended by the Cohen Committee is practically never given to him (Chapter 11) and it is therefore irrational that responsibility for action should be placed on him.

14.8 Responsibility for implementing the advice of the bacteriologist should rest on the medical administrator, i. e. either the Chairman of the Medical Committee or the Medical Superintendent. In most instances the recommendation merely involves the transfer

of a patient to isolation. Consultants have a moral and legal responsibility to prevent their patients from infection. What is less often recognised is that they have also a moral responsibility to take reasonable precautions that organisms from their patients do not infect others irrespective of the doctor in charge of them. Consultants usually agree to the transfer and that is all that is necessary.

When difficulties arise through a conflict of interests (para 9.5) or when the closing of a ward has to be considered, the medical administrator has to take action and he usually informs the Senior Administrative Medical Officer of the Board.

14.9 In large hospitals, the bacteriologist needs skilled assistance from a consultant colleague, a medical assistant or a senior registrar. If, in addition to his duties as the bacteriologist he has to take on the duties of a C.O.I. Officer he may need still further help in the form of a hygiene officer, a control of infection sister or a control of infection nursing officer.

14.10 Opinions are sharply divided on the necessity for appointing a Control of Infection Sister or Nursing Officer (I.C.S., or C.O.I.N.O.).

To be successful, the I.C.S. should have wide experience in different aspects of nursing and an interest in the control of infection. She must have a pleasant personality, tact and

pertinacity.

She should be appointed to Matron's staff and be seconded for duty with the C. O. I. Officer. Planning before an I. C. S. is appointed should ensure that she will be fully occupied in duties commensurate with her nursing training and experience.

14.11 A Control of Infection Committee should be appointed. It should be small with the chairman having power to co-opt. Suitable members are the bacteriologist, a physician or surgeon, the matron, the Medical Officer of Health of the Local Authority and the Consultant Physician in charge of the local Infectious Diseases Hospital. The last-named is particularly useful when the facilities for isolation within the curtilage of the hospital are poor or non-existent.

The Matron should have the right to invite members of her staff to any meeting at which nursing procedures are likely to be discussed.

The choice of the Chairman is important (para 10.13)

The C. O. I. Committee should be used for formulating policies and defining responsibilities.

14.12 Relations between the hospital and the Medical Officer of Health should be improved. This would be to their mutual advantage. The Medical Officer should be a member of any C. O. I. Committee.

14.13 Research is needed in the shape of continuous and intensive observation on the behaviour of pathogenic micro-organisms so that the methods for their control may be adjusted to secure the maximum effect.

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and departments served by Portsmouth and Poole Central
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APPENDIX A

The following Departments, Regional Hospital Boards, Hospitals, Medical Schools, and centres were visited.

England. Newcastle Regional Hospital Board, Newcastle.
South West Regional Hospital Board, Bristol 8.
South West Regional Hospital Board Training
Centre, Taunton.
Wessex Regional Hospital Board, Winchester.
Medical Research Council Industrial Injuries
Burns Research Unit, Birmingham 15.
Birmingham Accident Hospital, Birmingham 15.
Central Middlesex Hospital, London, N.W. 10.
Dudley Road Hospital, Birmingham 18.
Royal Infirmary, Bristol 2.
Royal Infirmary, Sutherland.
Ryhope General Hospital, Co. Durham.
St. Andrew's Hospital, London, E. 3.
St. Bartholomew's Hospital, London, E. C. 1.
St. Mary's Hospital, London, W. 2.
St. Stephen's Hospital, London, S. W. 10.
West Middlesex Hospital, Isleworth.
Hospital Centre, London, W. 1.

Scotland.

Scottish Home and Health Department, Edinburgh 1.

Eastern Regional Hospital Board, Dundee.

South Eastern Regional Hospital Board, Edinburgh 3.

Administrative Medical Staff Training Committee,
Edinburgh, 10.

Falkirk and District Royal Infirmary, Falkirk.

Raigmore Hospital, Inverness.

Royal Edinburgh Hospital for Mental and Nervous
Disorders, Edinburgh 10.

Royal Infirmary, Aberdeen.

Royal Infirmary, Edinburgh 3.

Royal Northern Infirmary, Inverness.

Victoria Hospital, Kirkcaldy.

Victoria Infirmary, Glasgow, C. 2.

University of Edinburgh, Bacteriology Department.

University of Edinburgh, Department of Nursing
Studies and International school.

Scottish Hospital Centre, Edinburgh 4.

Northern

Royal Victoria Hospital, , Belfast.

Ireland.

APPENDIX B

Extract from:

The Ministry of Health's Procedural Memoranda
I (1951) and Ia (1955).

"In order to control and prevent the spread of infection all Hospital Management Committees and Boards of Governors are recommended to set up a Control of Infection Committee on which, in addition to representatives of the medical, surgical, pathological and other staff, there should be adequate representation of the nursing staff. The Matron and at least one ward sister and the Sister of the Reception or Casualty Department should be members and where the hospital is a training school, a sister tutor. It is also desirable that the Medical Officer of Health of the local sanitary authority should be invited to join the Committee. The Committee would be an advisory body and a medical officer appointed by the hospital authority would exercise executive functions for the control of infection in the hospital with the Matron controlling nursing techniques in order to minimise the spread of infection. Among the matters which it ~~should~~ consider would be the measures to be

taken to prevent the spread of infection from members of the hospital staff and visitors: the instructions to be given to members of the staff dealing with patients, in particular to nurses, who are a potential source and means of spread of infection; and arrangements for regular statements of infections occurring in the wards".

Extract from the Ministry of Health's Procedural Memorandum 1a (1955).

"4 CONTROL OF INFECTION COMMITTEE

Reference was made in the main memorandum (No. P.M.I.) to the measures which the Control of Infection Committee should consider to prevent the spread of infection from hospital staff and visitors. Domestic, portering and kitchen staff attached to wards or engaged on any work which might bring them into direct or indirect contact with patients can be a source and means of spread of infection.* It is considered desirable, therefore, that in addition to those officers mentioned in the main memorandum, the Domestic Superintendent and the Catering Officer should be members of the Committee."

*It will be for the Control of Infection Committee to ensure that appropriate and specific arrangements for these conditions are made and are understood by the various grades of staff.

APPENDIX C

THE CONTROL OF INFECTION OFFICER

Extract from

The Ministry of Health's Report "Staphylococcal Infections in Hospitals" (1959), H. M. S. O.
(The Report of the Cohen Committee).

Para 39.

The hospital Control of Infection Officer occupies a key position in the co-ordination of regular preventive measures and the control of outbreaks.

Paras 159-161

Control of Infection Officer.

159. Within the hospital it is essential to have one person responsible for reviewing information on the incidence of sepsis, and co-ordinating preventive measures. The choice of this Control of Infection Officer should be carefully considered because the success of any scheme of control will largely depend on him. Nomination could well be made by the Control of Infection Committee with the approval of the Medical Staff Committee.

160. The Control of Infection Officer must be in a

position to advise in his own right and should therefore be a senior member of the medical staff. The hospital bacteriologist is often the person of choice, but clinicians might well be encouraged to take close interest in the work.

161. The functions of the Control of Infection Officer are to keep the responsible members of the hospital staff informed of the incidence of sepsis, to advise preventive measures and to check their efficiency. His information and advice may be given informally or at meetings of the Medical Staff Committee or the Control of Infection Committee. He could, with advantage, help in the training of staff.

APPENDIX DThe Content of Medical Administration.

(after Peters, R. J., and Kinnaird, J. 1965,
"Health Services Administration", Livingstone,
Edinburgh.)

1. Continuous advice to the governing body on the best use of the available beds and all other facilities for patients;
2. Coordination of the work of the medical departments and matters of medical administration arising therefrom;
3. Liaison work on medical matters with R.H.B., L.H.A., the local Executive Council, the coroner, etc.:
4. Medical supervision and control of admissions and discharges;
5. The survey of waiting lists and action to be taken to meet varying pressures on different departments;
6. Departmental supervision and coordination of medical auxiliaries;
7. Medical aspect of the almoners' work;
8. The medical arrangements to cover the smooth running of the out-patient clinics, appointments system, casualty department, etc.;
9. Supervision of medical equipment and medical supplies in cooperation with chief pharmacist.

10. Medical records;
11. Hospital discipline involving patients;
12. Discipline of junior medical officers;
13. General supervision of the health of the staff;
14. Notification of infectious diseases; coordination of measures to prevent the spread of infection within the hospital and the investigation and control of any outbreaks of epidemic disease or cross-infection within the hospital, in association with the Local Authority where necessary.
15. Supervision of any area service provided by the hospital, e.g. obstetric flying squad, blood transfusion service where appropriate.

In addition there should be added:-

1. Supervision and organisation of services for emergencies, major accidents.
2. Supervision of the civil defence arrangements, recruitment and training.
3. Organising any scheme of domiciliary care that the hospital may be developing.
4. Collecting data and statistics relevant both to short-term and long-term planning of the hospital's development. The Medical Superintendent should be

continually examining the situation from the point of view of public need and demand.

5. Studying planning projects along with architects, Consultants, nursing staff and staff of other departments concerned.
6. He should make a special study of some aspect of hospital construction, making the subject his own - e.g. theatres ventilation, central sterile supply, x-ray departments, casualty departments, etc.

APPENDIX E
ST. BARTHOLOMEW'S HOSPITAL

Charge to the Sanitary Officer

1. You shall be responsible to the Treasurer and Governors for reporting the sanitary condition of the hospital.
2. You shall keep yourself informed, by periodical inspection and as occasion may require, and if necessary advise on:
 - (a) the conditions of all sanitary appliances within the hospital precincts:
 - (b) the general sanitary circumstances prevailing there, and
 - (c) as far as possible, any influence injuriously affecting or likely to affect, the health of persons residing either in the Wards or elsewhere within such precincts.
3. You shall review from time to time the arrangements for dealing with sterilisation, disinfection, disinfestation and isolation within the Hospital precincts, and advise thereon.
4. On obtaining information of any infectious disease arising amongst the patients, or other inmates of the Hospital, you shall if you think desirable, and in conjunction with the Consultant in charge of the case, make enquiry into the circumstances of the occurrence, and advise thereon.

5. You shall present to the Treasurer and Governors once every three months, and at such other times as you think necessary, a report on the general sanitary state of the Hospital, and on any measures that you may think desirable to be taken in order to amend faulty sanitary circumstances, and on enquiries and other proceedings in which you have taken part during the past quarter.
6. You shall not absent yourself from your duties without requesting permission for such absence by an entry in the Leave Book in the Clerk's Office, naming your deputy.
7. In furtherance of these your duties, you shall at all times maintain such relations with the medical and surgical staff of the Hospital and with other members of the Hospital staff as will tend to the efficient performance thereof.

The foregoing is the Charge of your office, to which you are appointed subject to any alteration of, or addition to, your duties, as above set out, that may at any time or time hereafter be made by the Governors.

APPENDIX F.CONSTITUTION OF THE CONTROL OF INFECTION
COMMITTEE

Extract from :

The Ministry of Health's Report "Staphylococcal Infections in Hospitals (1959). H. M. S. O. (The Report of the Cohen Committee).

"CONTROL OF INFECTION COMMITTEE

167. It is recommended that this committee should be composed of :

- (a) Clinical members nominated by the Medical Staff Committee, including the Control of Infection Officer and the consultant bacteriologist or hospital pathologist, if one of these is not also the Control of Infection Officer;
- (b) The Matron and at least one other senior member of the nursing staff, including a sister tutor if the hospital is a training school for nurses.
- (c) The Hospital Secretary.

It is highly desirable that the Medical Officer of Health of the local sanitary district should be represented on this committee."

APPENDIX G.

THE ACTIVITIES OF THE CONTROL OF
INFECTION COMMITTEE

Extract from:

The Ministry of Health's Report "Staphylococcal Infections in Hospitals" (1959). H. M. S. O. (The Report of the Cohen Committee).

Para 168.

The Control of Infection Committee should hold regular meetings to review the hospital's sepsis record. Extraordinary meetings should be convened whenever the level of sepsis is giving rise to concern, in order to advise on special measures to be adopted in the face of an outbreak.

APPENDIX H.

RECORDS OF INFECTIONS

Extract from:

The Ministry of Health's Report "Staphylococcal Infection in Hospitals" (1959). H. M. S. O. (Report of the Cohen Committee).

Para 56

"For ordinary purposes what is needed is continual observation, both of patients and of staff, for clinical signs of infection and the maintenance of accurate records of the findings. The present report is concerned specifically with staphylococcal infections but it is evident that disease caused by other organisms will also enter into the same set of primary observations and records. The object is to enable the responsible hospital authority to have information about the incidence of clinically recognisable infections readily available at all times. This information forms the necessary background to any scheme of control. It is needed:

- (a) to assess the efficacy of the regular preventive measures in use in the hospital;
- (b) to recognise, by any unusual level or change in level of incidence, the existence or impending spread of an outbreak; and

(c) to judge the desirability of introducing special measures to control an outbreak, or threatened outbreak, and to assess the efficacy of such measures.

If the purposes for which the information is required are kept clearly in mind, the detailed procedures for its collection in a particular hospital are best determined by those who know the local circumstances. "

APPENDIX J.

Instructions in the Infection Register used in the wards
of St. Mary's General Hospital, Portsmouth.

1. Ward sisters must keep books and record all cases of ward sepsis, drip sepsis and post-operative urinary infections in which there are definite clinical symptoms.
2. Sisters must show the book to the consultant every week on his round. The consultant may PLEASE INITIAL it and add any remarks in the appropriate column as he thinks necessary.
3. Sisters have the authority to send swabs of suspicious wounds to the Pathological Laboratory as soon as noted.
4. Criteria of sepsis are given below:-

Wounds

Erythema

Stitch abscess

Serous discharge

Pus

Gaping wound

Healing by granulation

Pyrexia associated with
any of these

Drips

lymphangitis

pyrexia with
lymphangitis

5. "Evidence of Infection" - in medical cases the opinion should be given by the consultant or his registrar.

APPENDIX K

MONASH UNIVERSITY, Wellington Road, Clayton, Victoria,
Australia.

Extract from - University Calendar, 1966, p. 447.

MICROBIOLOGY

Teaching in bacteriology, virology and some aspects of immunology is given throughout the 4th, 5th and 6th years of the medical course. The bulk of the systematic teaching takes place in the first two terms of the 4th year when some 46 lectures and associated practical classes cover the medically-important groups of bacteria, viruses and certain parasites. In the third term of the fourth year the integration of microbiology with the clinical aspects of medicine is attempted by lectures on general infectious disease topics and by some twenty joint sessions or class discussions in which the medical staff of Fairfield Infectious Diseases Hospital, the Department of Surgery, State Epidemiologist, and other teachers with the staff of the Department of Microbiology. At other times during the 3 clinical years the interrelationships of microbiology and clinical medicine are illustrated by combined sessions during which clinicians, microbiologists and pathologists discuss together different facets of infective disease problems.

In fifth year the students are in residence for about a fortnight at the Fairfield Infectious Diseases Hospital. During

this period there is a daily two-hour laboratory session consisting of commentary, question and answer inspired by the results of the laboratory tests carried out on patients the students have seen during clinical ward rounds. Apart from this, during the ten week period of residence at the Alfred or Prince Henry's Hospital, three days are spent clerking in the hospital bacteriological laboratories. Teaching here is designed to illustrate the intelligent use of the laboratory and the interpretation of laboratory results. In sixth year there are a number of combined teaching sessions with the Department of Pathology dealing with the pathogenesis, pathological findings, and aetiological agents of a series of infective diseases. There will also be sessions at both the Alfred and Prince Henry's Hospitals designed to refresh and reinforce students' knowledge of clinical microbiology.

APPENDIX L.

General Nursing Council for Scotland.

Extract from:

Guide to the Syllabus of Subjects for General Nurses
(1963.)

"CONTROL OF INFECTION"

It is considered desirable that nurses should receive practical experience in the control of infection in an Infectious Diseases Hospital. It is appreciated, however, that this may not always be possible and it is hoped that a lecture programme will be planned which can be adapted for those nurses who may receive only theoretical instruction in a General Hospital. In either case, lectures should be given by a specialist in Infectious Diseases.

Brief reference should be made to communicable disease in relation to modes of spread of infection, i. e., inhalation diseases, ingestion diseases and inoculation diseases. Methods of control within the hospital and in the community should be discussed and this should include detailed reference to the special nursing care necessary for infectious patients. Special reference should be made to the occurrence of cross infection in hospitals.

While the emphasis in teaching should be on control of infection, it is hoped that when nurses are seconded to an Infectious Diseases Hospital they will be given the opportunity to see as much as possible of the various diseases treated in that hospital. "